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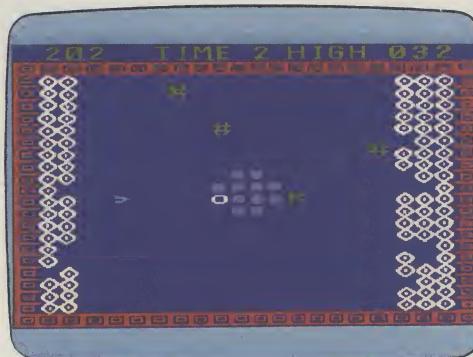
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VC6/83	
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This series just has to be the best introduction you'll find to the graphics capability of the Vic — nice and gentle, yet authoritative and detailed. Part three looks at the mysterious multi-colour mode.

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Vic Revealed is widely regarded as the best single source of info on the Vic. It's just been published with a new covers as a revised and corrected edition and sceptics like me read it from cover to cover: is it worth the praise — or the money?

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We're planning a whole series of multi-product reviews on offerings from the more prominent suppliers in Vicland. Ken Ryder kicks off with a look at what **DAMS** offers in the way of add-on hardware

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All your own work. Some nice offerings this time.

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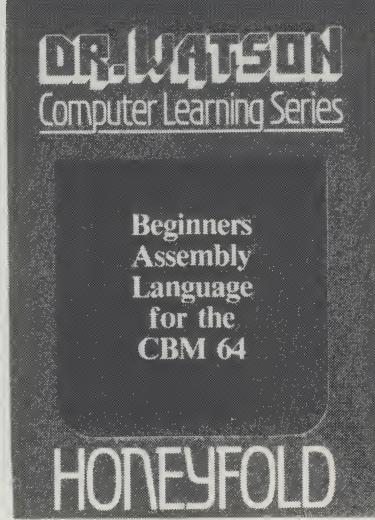
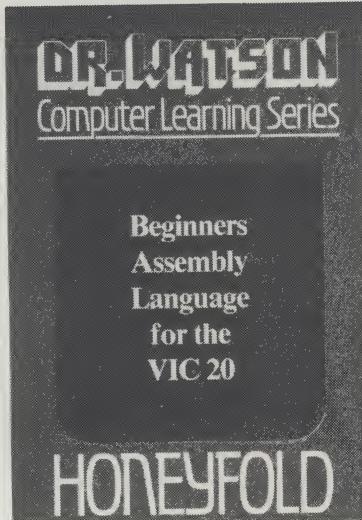
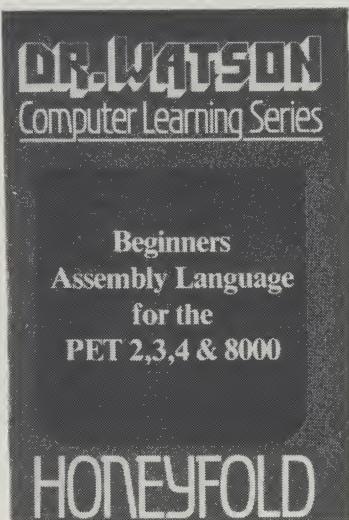
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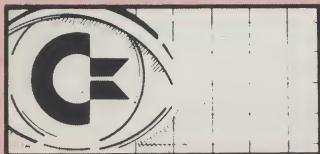
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Tales From the crypt

Our Man in the C2N Queue reports

by Henry Deckhand



Rumour was rife in Commodoreland last month. It was said that the 700 had been delayed by bugs; that the 500 had been cancelled; that supplies of the Vic were harder to come by than Boy Scouts who know what a bob is; and that yet more key personnel had departed. In the absence of official comment ace Commodorologist Henry O'Deckhand pieced the story together.

David Frasov is a lucky man. A rising aparatchik in the Commodore bureaucracy who lost faith in the system, he was fortunate enough to secure an exit visa. Today, unlike many exiles, he has a good job — at Microsoft. Does he miss the old company? Fraser looks over his shoulder nervously before shaking his head. Even in the outside world he can never be sure that the long arm of the Commodore will not reach out to him.

Other dissidents have been less lucky. Some like Comrade Pip Erringtova have been quietly transferred to the obscurity of the European division. Others like Comrade Andrew Goltz have disappeared for a year's "medical treatment". Many, like Nikolai Greenof, have simply become unpersons.

This much is well known to outside observers. What Commodorologists have not yet been able to reconstruct is the precise sequence of events that lead to the dramatic exiling of former First Secretary Gleadow to the rocky remoteness of Hong Kong.

That a major purge had been under way for some months was known to Commodore watchers as a steady trickle of defectors continued to find

means of escape through the Iron Curtain of Secrecy that surrounds the company.

The first clue that a major shift in power had occurred emerged on May Day when company commissars traditionally inspect a parade of the latest hardware. Gleadow was nowhere to be seen. In his place stood Yuri Stanopov, former boss of the company's feared litigation directorate. Some observers believe that the putsch has been engineered by company ideologist Kit Spencov. Mystery also surrounds the role played by Piotr Walkev, a former editor of the official organ Petvda and recently promoted Minister of Disinformation.

One possible reason for the shakeup is the disastrous performance of factories assigned to the production of business computers. The five year plan called for the production of models 500 and 700 by the end of last year. Not only were quotas not met, but in the event none at all were produced. Catastrophe was only averted by the Central Committee's decision to reverse an earlier order for the termination of Vic production. Managers in charge of these factories are also reported to have been terminated with extreme prejudice.

A report on the subject appeared in the last issue of the Samizdat magazine controlled by Trotsky look-alike Nikolai Hampshirov. Publication of the article (which suggested that the promised model 700 would not appear for nine months and that the 500 would not appear at all) resulted in a crackdown by agents of the NVKD (Not Very Kind to Dissidents) secret police.

One shadowy senior figure who appears to have survived unscathed the night of the long EPROM-burners is Marketing Functionary Jan Baxtr. Notes leading commentator Davidov

Briggski: "Baxtr has never accepted the doctrine of collective decision-making. Therefore he shares no blame for the failures of the leadership and/or revisionist underlings."

Whatever the problems in the industrial sector, one thing is certain. The corporate megalith will not deviate from its policy of ruthlessly confronting the competition with ever cheaper, more powerful products. According to evidence smuggled out by dissidents, a secret weapon is under development. All that is known about it is that it is called "the Mouse".

Meanwhile a shroud of disinformation surrounds the appearance of various non-products at so-called Public Exhibitions and Dealer Previews. The upshot of this is that a new computer will or will not become available, a portable system the size of an executive briefcase incorporating three separate screens (22, 40 and 80 characters wide), eight different microprocessors, integral electronic drum machine, and optional carrying handle. Vic owners will or will not be able to upgrade to this new uncomputer on payment of £25. It will not accept Vic games cartridges.

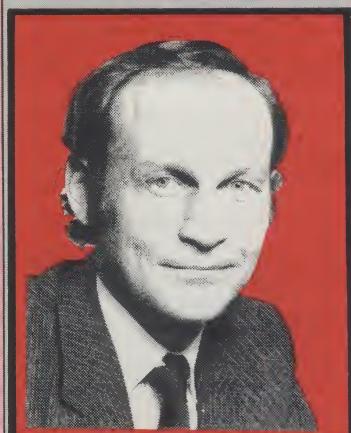
Stop Press: The following communiqué was issued by Comrade Piotr Walkev, Minister of Disinformation:

"Notwithstanding a number of ROM bugs in the glorious Model 700 occasioning delays therein, volume deliveries will now commence in July. Suggestions to the contrary will attract the usual penalties."

"The glorious model 500 will not now be produced on account of the likelihood of it being rendered obsolete by the prior release of a glorious new model, the details of which remain a State secret. The 500 is dead. Long live the 500!"

New man at the top: One Howard Stanworth has been appointed General Manager of Commodore Business Machines (UK) to succeed Bob Gleadow, who gets promotion to sort out Commodore Hong Kong. The relevance of the new man's immediate experience escapes us — he was a director of St Ivel and MD of Unigate Dairies (Midlands).

The press release promises "a wide range of management skills...at a time when the Company is dramatically expanding its UK activities". It seems this appointment is "the first in a series of moves which are being implemented to coincide with the establishment of the Commodore European manufacturing and distribution headquarters in Corby and reaffirms the Company's commitment to maintaining its lead in the production of a wide range of home, personal and business microcomputers". Got that?



Making money (contd): Mind you, they can afford the new man. Commodore headquarters has just announced records for sales and profits in the third quarter and the nine-months ended March 31, 1983; both were up by more than 100 per cent on the equivalent periods last year.

Dogged: Maybe the Americans like the idea of dogs (see the relevant chapters of *My Secret Garden* for evidence). Commodore in the States is giving away 100 64s and a thousand Vics as prizes in a nationwide promotional campaign for dog food in a Liv-a Snap pet treats. Where will it all end? 3

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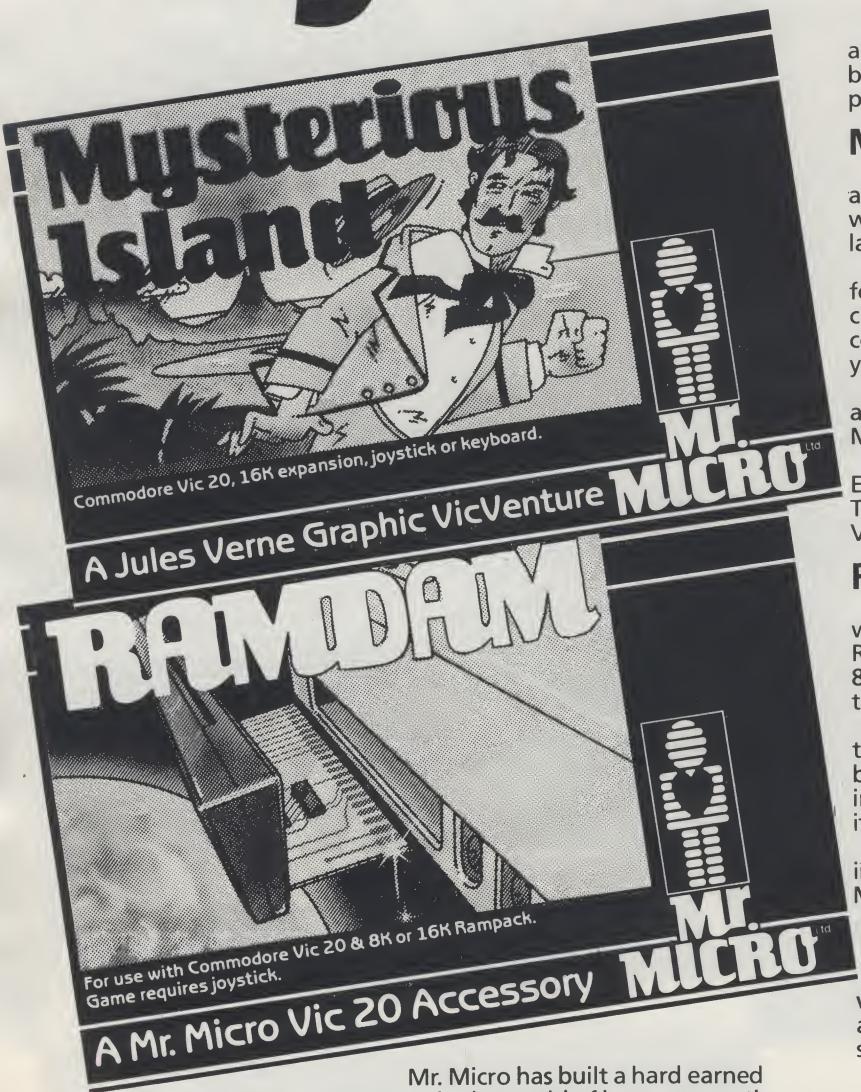
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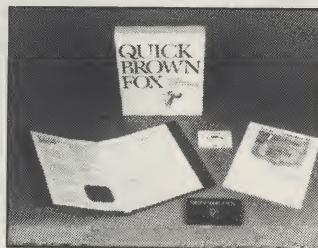
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Foxy WP

"Full word processing for under £1,000" promises SPT Electronics. You get there via a 64 (or a Vic, but the 64 is obviously preferable) and Quick Brown Fox, an engagingly-named US word processing program for which SPT has UK rights.



The rest of the deal is additional memory, an 80-column display monitor and a daisy-wheel typewriter which doubles as a computer printer. This combination produces a fully-fledged word processing workstation.

Says SPT, "The system provides features that would previously only have been found in systems costing at least £2,500. Fully justifiable text which can be viewed on the screen is usually only found in much more expensive systems. Our own monitor gives the very best clarity and definition, and our boilerplate system has 10 levels of nesting. Add to this our 80 column board to view the actual prepared text before printing and the Q.B.F. system is hard to beat".

You can buy the software alone, of course, and if it's as good as SPT claims it should be a bargain at £60.

And what exactly are you getting? Well, SPT says Quick Brown Fox permits full editing even on the Vic-20's 22 column display, something that more expensive packages cannot do. And Quick Brown Fox allows automatic reformatting of editing text.

All Quick Brown Fox commands are reckoned to be logical, single-key operations. Some competing programs require complicated two-finger acrobatics to implement a command — Quick Brown Fox is simple and to the point: a user hits the "T" key for type, "V" for view, and so on. Other goodies include a built-in routine that converts the Vic-20 to run on Centronics parallel output. This gives the user greater options in choosing peripheral equipment and does away with the need for expensive adapters.

Quick Brown Fox is also claimed to take less memory than its competitors — "thus freeing more memory for the actual word processing, the job it was designed for". For example, Quick Brown Fox works on the standard Vic without the need for additional memory expansion.

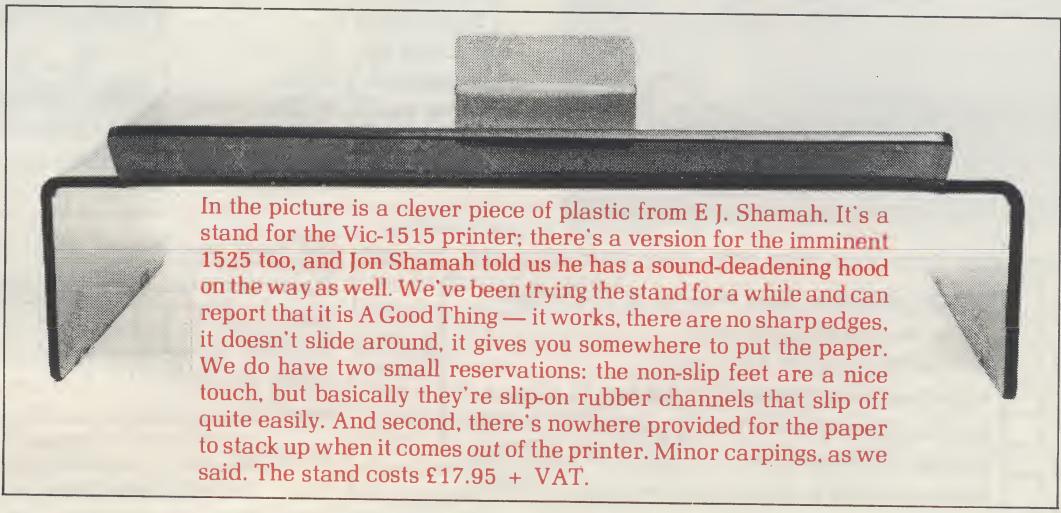
Quick Brown Fox can also send and receive information from one computer to another via built-in telecommunications facilities — accomplished either by telephone modem or by direct hook-up via the RS-232 port. This option is designed to let QBF systems talk to one another, though it can work between Quick Brown Fox and some "foreign" systems too. That we think, is unique.

Iffy: "Fed up with software houses protecting their programs and not giving you a backup copy?" asks a new company called Novasoft. They have the answer in the form of Buccaneer, a £5.95 machine-code Vic-20 program that produces fully automatic copies of anything — "will break all known protection methods". Can't believe that software suppliers will be too happy about the idea ... or that name.

... **Iffier:** Novasoft also has a couple more interesting utilities. Also £5.95, Juggernaut is a menu-driven memory shifter that apart from several other goodies lets you get into the RAM usually reserved for cartridges — so you can up the memory maximum to 37.5K (machine code only, we think) ... and take tape copies of cartridges as well, by the look of it.

... **Non-iffy:** Less controversial is the other Novasoft routine, a Vic reconfigurator called Mirage. It resets an expanded Vic to 3.5K or 6.5K; it costs £5.95 too. One the other hand, you could read **Todd's Lore** in this issue...

Tacky: On sale in the States is a Vic cartridge called Queen's Bedroom. "All your life you wanted to spend an afternoon with the Queen..." Such good taste not to say a night with our sovereign lady, isn't it? The cover pic shows a grinning masked marauder firing champagne corks at the Guards (complete with savage Corgis) while the Queen (looking not unlike Snow-White) gasps in the background.

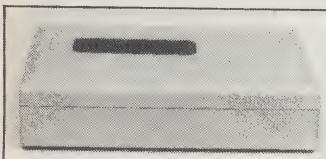


In the picture is a clever piece of plastic from E.J. Shamah. It's a stand for the Vic-1515 printer; there's a version for the imminent 1525 too, and Jon Shamah told us he has a sound-deadening hood on the way as well. We've been trying the stand for a while and can report that it is A Good Thing — it works, there are no sharp edges, it doesn't slide around, it gives you somewhere to put the paper. We do have two small reservations: the non-slip feet are a nice touch, but basically they're slip-on rubber channels that slip off quite easily. And second, there's nowhere provided for the paper to stack up when it comes out of the printer. Minor carpings, as we said. The stand costs £17.95 + VAT.

Good Pod!

Following the launch of Interpod — Oxford Computer Systems' good-looking 'intelligent interface' for the Vic and 64 — the company has announced that orders worth at least \$200,000 have been received in its first month of marketing in the States. The result is that Oxford Computer Systems is confident of sales in excess of \$1,000,000 within the next six months:

The unit plugs directly into the serial port of the computer, enabling the user to communicate with any RS232 or IEEE device "without compromise to internal memory". Interpod thus enables Vic and 64 users to access the entire range of Commodore peripherals including floppy disk drives, hard disks, printers and plotters.

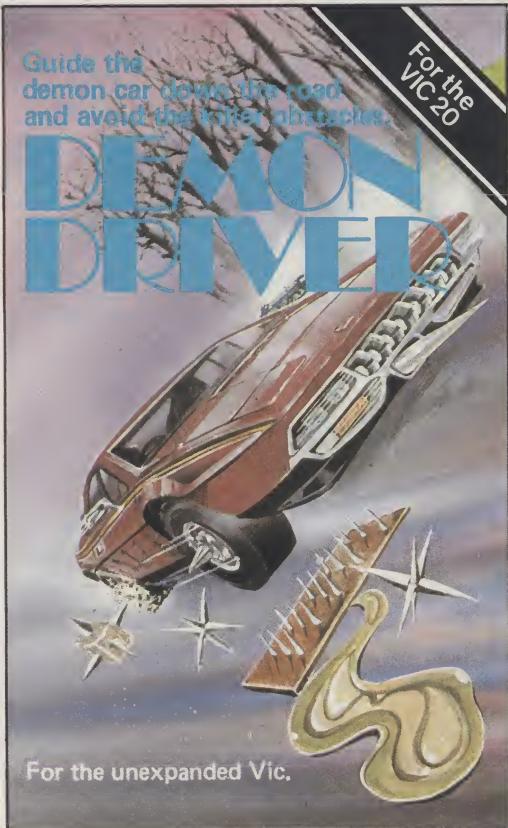
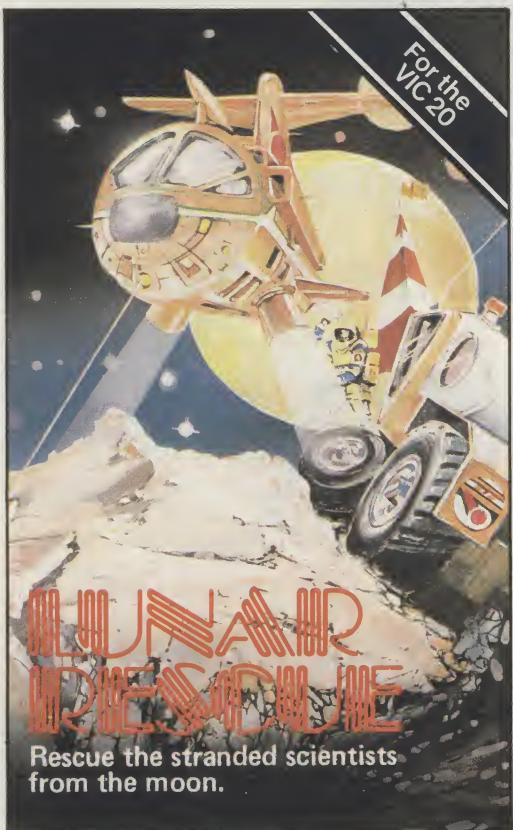


And as if it wasn't making enough money already, Oxford Computer Systems recently sold the 2,000th copy of PET SPEED. This probably confirms PET SPEED's position as the world's leading Basic compiler for Commodore computers: PET SPEED is now available for the entire range of Commodore business computers, including PET SPEED 64 (optimised for the Commodore 64) which has been purchased outright by Commodore.

An optimising Basic compiler, PET SPEED reckons to give the maximum possible execution speed for programs written in Commodore Basic without producing prohibitively large object programs. The package thus transforms painfully slow CBM programs into fast and smooth-running professional software.

The package claims to be extremely easy to use; typical compilation time are quoted as averaging just two minutes (approximately one second per code line) and "most programs can be completed in about five minutes".

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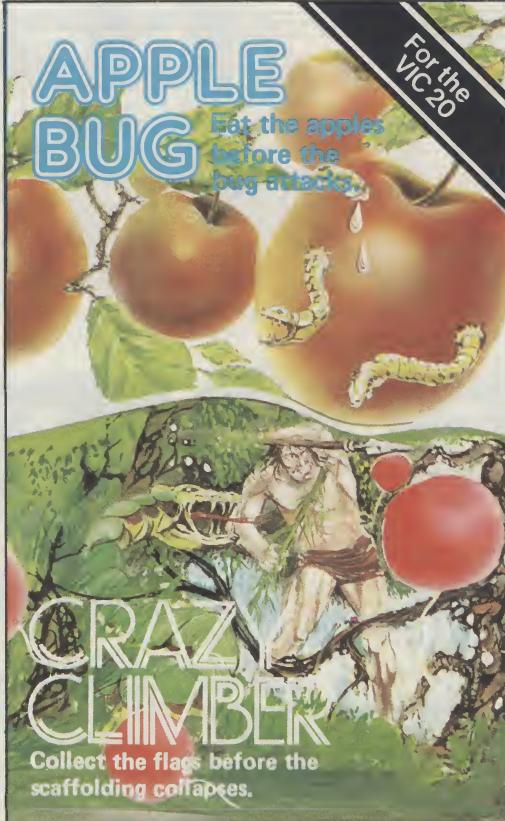
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Inside the Commodore 64

the 64 Programmer's Reference Guide reviewed by Ken Ryder

The advertisements for the Commodore 64 promise high resolution graphics, horizontal and vertical scrolling, multi-colour sprites, sprite collision detection, user definable characters and two user games ports. The rather thin user manual gives no clues as to how these features may be accessed. The Programmers Reference Guide for the 64 is now available from Commodore, but is it any better? Ken Ryder reports.

At first sight the book is certainly impressive. It has the same page size as the user manual — about A5 — but it is one inch thick, containing 500 pages and weighs in at a healthy 1lb 2oz (800g to younger readers). The paper is the same excellent quality as the user manual, and is bound with a plastic comb spine so that it can lie flat without breaking its back.

The manual starts with a short general introduction and lists 23 applications for the 64. The first chapter deals with the different types of variables, integer, floating points, strings and arrays and how they utilise memory. Boolean arithmetic (AND, OR, NOT) and a useful section on how to shorten programs are included at the end of the chapter.

Chapter two gives you the Basic vocabulary and is an expanded version of Appendix C of the user manual: each instruction is accompanied by a programming example. You also have a description of the keyboard and screen editor.

My opinion? The first two chapters are vital to new users — but not to the advanced programmers which this manual is aimed at. They should have been included in the handbook supplied with the 64. (But it's like the Vic's documentation in that respect — Ed.)

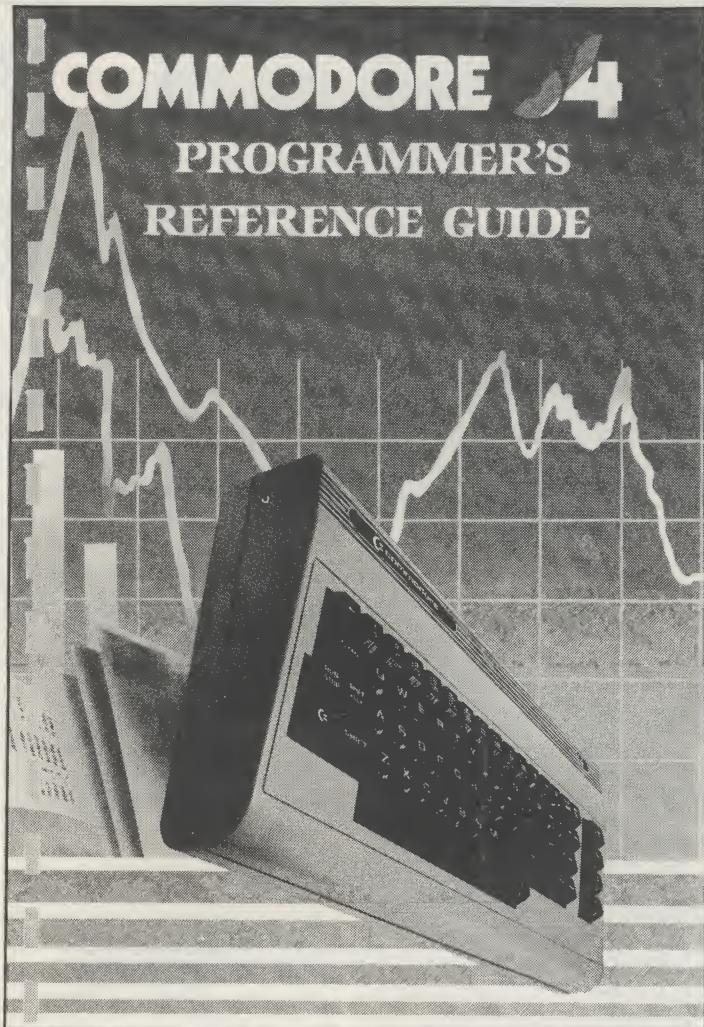
Chapter three is devoted to graphics. It starts with a general overview of the various modes — standard and multi-colour character mode, standard and multi-colour high-resolution graphics, sprites. Each topic is gradually expanded complete with a programmed example.

Useful hints, tips and warnings are scattered throughout the text... though some are vague. For example, one recommends that the bottom of Basic be moved above the high-res screen area to prevent Basic variables overwriting it; but no instructions are given on how to do this. Smooth scrolling of the screen is covered; but the example program does not demonstrate the full potential of this facility.

More pages are devoted to sprites than to the rest of the graphics. Sprite definition grids, positioning charts, and register maps are all included. The sprite section is divided into three sub-sections, one advanced, one elementary and one of brief notes. I found this rather disjointed and confusing, with much of the information duplicated and some repeated three times.

Considering the capabilities of the 64 the chapter on sound is rather short — only 24 pages, compared with 81 on graphics. It assumes a previous knowledge of musical terms, but it does at least explain the various waveforms available and filtering techniques. There are several example programs, but the Vic-20 user manual contains a better selection of sound effects: so overall, this chapter was the most disappointing in the whole book.

Machine code is covered in chapter five — hex notation, assemblers, addressing modes and the complete 6502 instruction set. It is not a complete guide to machine code but offers a good introduction.



This is followed by instructions on how to set up the various memory configurations of the 64 to suit particular applications — like CP/M, interestingly enough. The Kernal and its user-callable machine-code routines are fully explained. The chapter ends with a detailed memory map.

The final chapter deals with the various inputs and outputs of the 64 including outputs to the printer, modem, cassette and disk. Switch-type joysticks and paddles are also covered together with example machine-code programs: the light pen option is only briefly mentioned, though. The RS232 interface, user port, serial bus

expansion port and Z80 option are all covered in great detail.

The remaining quarter of the manual comprises 16 appendices containing the usual abbreviations for Basic keywords, screen display codes, screen and colour memory maps, register maps and technical specifications for all the special chips — the 6510, 6526, 6566 and so on. The SID chip is also fully described. A pull-out schematic diagram of the chips within the 64 is included at the back of the manual. Sprites are covered yet again, quadruplicating (if there is such a word) most of the information. And in the appendix 'sprites' are referred to as 'Movable Object Blocks', just to confuse the issue.

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TRADE ENQUIRIES WELCOME



The 64 Page

■ The general layout and presentation of the manual is good. The example programs are adequate but not brilliant, the line by line explanations of some programs are extremely useful. The English (Americanese) is OK and spelling mistakes are few.

My main criticism is that this manual is expensive at £15 and should have been provided with the computer in the first place. Commodore has failed in its responsibility to the user by not providing us with sufficient information in the User Manual to use the 64 to its full. But if you do want to make the most of your 64 then pay the price and buy the Programmers Reference Guide!

Audio 64 . . .

Audiogenic has three new games for the Commodore 64 "as a reflection of their commitment" to the machine. And there's a new brand name for all of the 64 products from Audiogenic — SOFTWARE 64. Hmm.

The three games are Motor Mania ("a thrilling cross-country car race game" that

happens to be a great demonstration of sprite graphics of the 64); Renaissance, a 64 version of Audiogenic's best selling Vic cartridge that gives you a state-of-the-art Othello (for the 64 it's on cassette); and Grandmaster, "the chess program that beats all comers".

Apart from being a strong chess player, the Grandmaster program has several good facilities — like it displays a square board for easy visualisation of moves and has a choice of colour scheme for user friendliness, a helpful Hint function, the ability of take back moves, and the chance to force Grandmaster to make the move it is considering.

Grandmaster comes on cassette in a presentation box with full manual. We have one for review and will be reporting.

Prices are £8.95 for the first two, £17.95 for Grandmaster.

Also new from Audiogenic is a cartridge version of the Forth language, which should at least give Kobra's Forth cartridge some competition. This one was written by Audiogenic's own Dave Middleton.

Kobra strikes

Kobra has announced the launch of CalcResult for use Commodore 64. Previously available for Pets, CalcResult is a spreadsheet program which "rapidly becomes an irreplaceable tool for those involved in figure manipulation and relationships" (it says here). Budgets, reports, statements, forecasts and planning are all areas in which a saving in time and resources are as important as the ability to handle all forms of calculations: the features of CalcResult should simplify the rapid production and calculation of all aspects of business forecasting and planning.

Completely compatible with files from the CBM 8000 version, the CBM 64 version of CalcResult ought to provide users with a low-cost entry into the spreadsheet world.

The spreadsheet apparently works to a three-dimensional format "simplifying the creation of layouts, the extension of data handling and the addition of pages, while displaying a natural overview of the work in progress". Well, we've been given a review copy: so we can report later on those claims.

Meanwhile, features of the package include up to 32 pages per worksheet (that's a lot); horizontal and vertical page splitting (very handy); and 'window' facilities, so that portions of up to four pages can be displayed simultaneously. Full graphics output is also promised; and naturally the Commodore 64 version with full use of the 64's colour and graphics capabilities.

CalcResult costs £94.

Kobra's catalogue of 64 goodies also includes some other very attractive products, presumably as a result of some cannibal trawling around for US packages that it can sell over here. There's the Paper Clip word processor, which has had some very good reviews: Brad Templeton's PAL assembler (fits into 4K) and his Vic/POWER programmers' aid pack (top quality stuff); the 64 Switch we mentioned last time: Forth (an extended fig-Forth) at

just £33; and the 64 versions of the Datab AB cartridges already known for the Vic — REL (relay controls for reading external signals), STAT for statistical calculations, and the GRAF plotting routines.

More micros: According to a Liverpool-based market research company called Gowling Marketing Services, nearly a million homes in Britain have a micro in them — 940,000, to be exact, which is about one in 20. Sounds a bit low to us, with getting on for 100,000 Vics sold (not to mention a million ZX81s): Gowling says ZX81s are in just over 400,000 homes, Spectrums account for 131,600, and the Vic has 112,800 — and that last one looks a touch high. They didn't ask at 940,000 houses, naturally; they extrapolated from a poll of just 2,000.

Drummed out: Commodore has been carting around a set of electronic drums to US computer shows. It's a panel of three rubber pads that when hit provide apparently good percussion effects: it plugs into the 64 and obviously uses the SID sound chip. It may become available as a product (under the name Digidrum) but at present it's only a prototype.

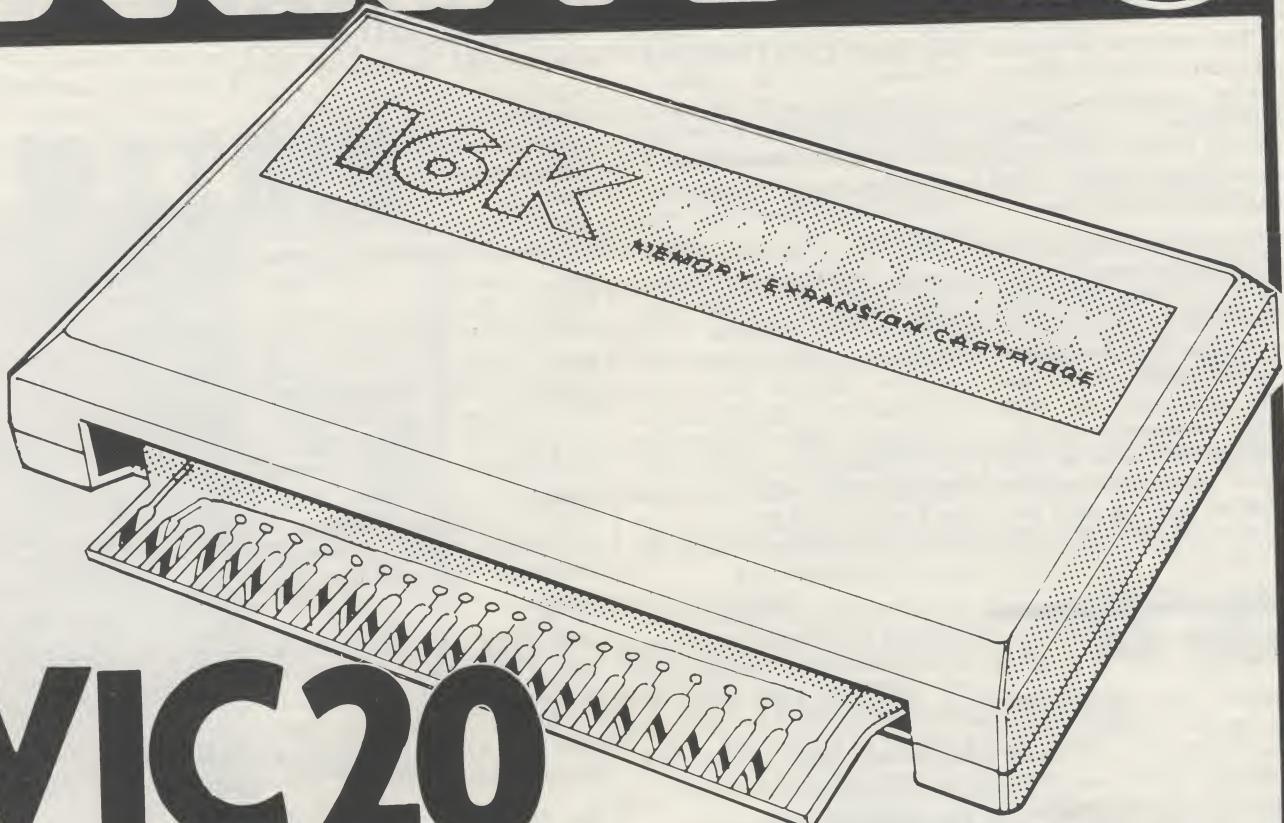
Keyboarding: A companion product not yet announced is even more interesting, a plug-in keyboard for the SID that fits into the cartridge slot and comes with some driver software. You get three octaves worth of keys, a feel reportedly not unlike that you get from a conventional low-price electronic organ, and ten preset 'instruments' built into it (each with a range of seven octaves). You can transpose up five semi-tones and down seven; you can save to disk or tape; and you can read a tune back into memory, then play along with it. Nice, eh? The guy responsible is Commodore Canada's British genius Paul Higginbottom.

Coming soon: We hear that the LOGO graphics language (good for kids and turtles) is in final testing for the 64. More interesting, perhaps, the CP/M operating system on an add-in board has also reached final test.

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Using the Vic disk

A report from the front line

by Mike Grace

Can the Vic really be used in a small business? Is there any application for the micro in serious tasks like word processing, mail-order, stock control and database? Some 'experts' would deny this but readers of Vic Computing will already know much of the advantages of these applications when it comes to small business use, (and at this stage I think we have to stress *small* in view of the amount of memory available in the Vic).

One aspect that seems to have been neglected so far is, however, the ease of use and (more important) the ability of the hardware to cope.

I have already described some of the limitations encountered on buying the Vic Printer (October 1982); so I thought a follow-up article on the 1540 Disk Drive could prove useful to other prospective buyers.

I am using my Vic for several applications, but for me the main one is the ability to print out address labels. At first I had this on cassette, which worked admirably but took an age to load every time — I had not originally been aware that it not only takes about two minutes to load the program, but obtaining the data from a tape file takes around another four minutes for 70 addresses. If I use the total capacity of memory available (which is about 200 addresses) it would take 10 minutes to completely load this data each time I want to use it.

This isn't so bad if you use the file rarely: you can leave the machine loading and go away to do something else. But I often find I need to update perhaps one address or name and waiting all that time to key in a few letters seems to take an eternity.

The answer...

The disk drive looked most attractive. I already knew the advantages of disk, having used a word processor with floppies. So, with just a little trepidation in view of the price I parted with my money. Buying a disk drive that cost more than double the Vic seemed a little crazy; and now the price of the Vic has dropped dramatically it must seem even more so. Has the 1540 been worth the money?



First steps

Well, at first I didn't think so. I turned to the User's Manual and read in paragraph one that I would benefit most if I first read through the entire manual before using my new hardware. In retrospect I can only assume this was intended as a feeble joke — or at least I hope it was: virtually all the manual was totally incomprehensible to me then, and still is today.

This is my first point, and as it has been made by many other people and by myself in my article on the Vic Printer I won't dwell on it too long. But why are the manuals for hardware written by people who already know so much about their subject they have forgotten souls like me haven't a clue?

First I was faced with a number of new and confusing commands like INITIALISE, SCRATCH, NEW, OPEN and CLOSE (were these the same as the OPEN and CLOSE for the printer?) as well as familiar commands like SAVE, GET and INPUT. And this was the first chapter on 'Learning How to use your Floppy Disk Drive'.

I moved on tentatively to Chapter 4 on 'Basic Commands for Data Handling' and things began to get worse.

"OPEN: This command sets up a correspondence between a logical file number and a file which exists on disk. It also reserves a buffer space within

the disk unit for operations on the file being opened."

Let's examine this a little more closely. The first sentence is quite unusual in that it talks about a logical file number (is there such a thing as an *illogical* file number; and if not, why not?); and then this number seems to want to talk to (or communicate in some other way) with a file on the disk. I cannot really understand what that means at all!

And it talks about reserving a buffer space. Now, while I do have a vague idea what this means, what *I don't know is why on earth I should ever want to do that*.

So the whole section is virtually meaningless to me. What I would like to see is another statement starting off with the words "An example of when you might wish to use this command is..."

The next chapter on 'Advanced Disk Programming' was as far as I got. I'm quite sure that it's possible for me to understand just what the manual is about. But until someone explains what the simple things mean in simple language I'm completely stumped. It's a problem of vocabulary more than anything — and I haven't yet found out quite what the vocabulary means.

Moving on

I set the manual aside and decided to play around with the actual

machine. At first things seemed all right. I could switch it on, load the Test Disk supplied, and run it successfully. So I started to play around with a disk of my own, trying to SAVE a simple program I had typed in earlier and saved on cassette.

My first struggle was with the command NEW which formats the disk prior to use. It seems that until a new disk has been formatted it cannot be recognised by the drive, and that by typing NEW this does the actual formatting (whatever that really means).

But of course it wasn't simple.

First the manual gives three separate ways of formatting, involving three different commands — and to confuse even more it doesn't say which of them is preferable. It also has the unsettling habit of stating that certain parts of the instructions can be omitted; for example the disk has a drive number 0, but the manual keeps telling me that I can leave this bit out. If I don't need to type it in, why bother to tell me about it in the first place?

The second bit of confusion arises from the fact that on starting to do anything with the drive you need to type OPEN 1,8,15 (or something very like this). But would you believe it — at the start of the first section on what to do it doesn't actually tell you this at all! 

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give you when it comes to real life? Well, speed on loading and saving: it really is fast. When it comes to 200 addresses, I can sit and wait instead of leaving the machine. And putting all my games on the one disk is an absolute boon compared with several cassettes cluttering up the table and getting lost or put in the wrong case.

Second, there's storage space. I seem to be swimming in storage I now have so much, with each disk capable of storing 175K (or nearly); I haven't even begun to get near filling a single disk yet.

Any disadvantages? I still have an uncertainty about the machine (based on my original experience I expect) and so I tend to keep back-up copies of everything on cassette tape. Incidentally I have often heard that a single drive is pretty useless as one always needs twin drives to allow you to copy disks. The serious business user needs this, but I cannot see the really serious user remaining with the Vic for very long; and for the small-time chap like me I feel twin drives to be an expensive and unnecessary luxury. I tend to take back-up disks for most of my programs, and compared with tape the unit is so fast that it's no hassle making two copies on two disks right from the start.

The other main point I feel is lacking is basic information on how to use disk drives — on their applications. Reading through the manual makes me aware of the fact the drive has great potential, but as I said earlier no-one actually spells out what these applications are to simple folk like myself. I have this criticism with the printer as well — I know it's capable of far more things than I use it for, but I don't really know what these things are.

I suppose if I sat down for several hours and manfully ploughed through each manual I would begin to grasp more applications — but why couldn't some-one else just write them in the manual at the beginning? And in plain English?

For example I have yet to master the complexities of sequential and random access file handling in the disk drive manual. One day I hope to tackle it.

But in the meantime I have no regrets with my purchase. The speed is formidable. The machine now works smoothly and easily, and I have yet to corrupt data or lose files since the repair.

Perhaps after another few months I'll be looking back at this article and wondering how I failed to understand what it all meant. If I ever reach that stage I'll write it all down and tell you what it's all about!

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Joysticks

Potentiometer Joysticks

how to use them

In December we ran an article on using joysticks on the Vic. Then we covered the simpler (and cheaper) 'switch'-type joysticks. Potentiometer joysticks cost more, but they give you better discrimination.

For a start, be warned — the Vic reads a potentiometer joystick quite differently from a switch joystick; and that means programs written for one type (including off-the-shelf games) will almost certainly fail to work with the others...unless you modify the program.

That's because switch joysticks — the cheaper, Atari-style variety — are read from the two 6522 VIA chips inside the Vic, and are addressed by PEEKing into locations 37137, 37139, 37152 and 37154.

Potentiometer joysticks are handled by the 6561 Vic chip inside the Vic (oh, why didn't they choose different names!) and utilise addresses 36872 and 36873.

And how do they work? Well, instead of a number of switches which are open when the joystick is in the central position and closed with it moved to one side, a potentiometer system gives a continuous range of values as the stick moves from one end of its range to the other.

By having two potentiometers mounted at right angles we can express any possible position of the stick in two numbers, X and Y, in the same way as we give the co-ordinates of a point on a graph:

Y potentiometer = 255
X potentiometer = 255
X potentiometer = 0
Y potentiometer = 0

The two outputs from the potentiometer joystick are connected to the 6561 chip where the analogue signal is converted to a digital number in the range 0 to 128.

With the stick in the central position, each value will be 128. If you move the stick along either the X or Y axis, only one value will change. If you move it diagonally, then both numbers will change.

The current X and Y values can be obtained quite simply using the PEEK function: **PEEK (36872)** gives the X value and **PEEK (36873)** the Y.

Programming

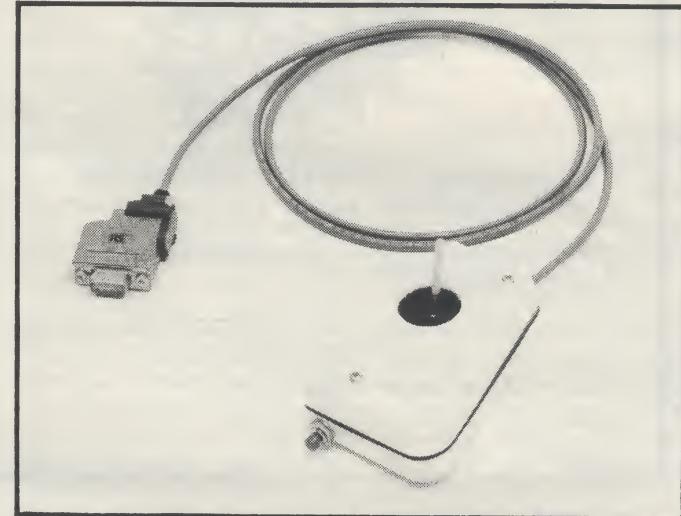
So writing programs for a potentiometer joystick is quite simple — much simpler in fact than writing for a switch joystick, and of course much more accurate (since greater precision of control results from each co-ordinates having a range of possible values from 0 to 255).

On the other hand, if you want to use the 'Fire' button you will have to get into a touch more complication. The Fire button is read by one of the Data Direction Register in one of those VIA chips. You'll have to kill the keyboard as an input device (**POKE 37139,0**) and then set that DDR to read the games port (**POKE 37154,127**).

Then the operation of the Fire button can be checked by looking at address 37137 or 37152. Why two locations? Because some potentiometer joysticks have two Fire buttons, in which case both locations will be used. If yours has only one, some experimentation may be necessary to find out which is changing its value when the Fire button is pressed. But it's likely to be 37137.

Bit 5 of 37137 is set when the button is pressed. The easiest way to check this is with an AND:

X = PEEK (37137): FX = (X AND 16)/16



If it's 37152, bit 7 is set. The equivalent test is:

Y = PEEK(37152): FY = (Y AND 128)/16

Subsequently you'll need to disable the games port as the Vic's input device and get yourself back to the keyboard:

POKE 37154,255: POKE 37139,128

Conversion

But converting programs to use a joystick of this type is a lot more difficult than for the switch type. We could set up variables X and Y:

9000X = PEEK(36872): Y = PEEK(36873): RETURN

That enables us to set up a program above like this:

**1000 GOSUB 9000
1010 IFX>128 THEN 1100
...etc.**

But this obviously wastes most of the potential of the joystick by using it as a simple switch type. To put it simply, there are only nine possible switch positions (including 'home'); but the potentiometers have a total of 255.

Because of that range of possible values it's impossible

to give precise details of how to convert programs to use an analogue (potentiometer) joystick; but here at least are a couple of hints.

The program will probably have two variables, say XP and YP, which hold the X and Y co-ordinates of the object being controlled. Going back to our test program from the December 1982 issue, line 1100 might read:

**1100 YP = 10: REM
MOVE OBJECT DOWN**

...with similar lines for the other three directions. We could use the analogue reading instead something like this:

**1000 GOSUB 9000
1010 XC = XC + (128 - X)/10
1020 TC = YC + 128 - Y)/10
1030 GOTO 1000**

We can vary the 'sensitivity' of the joystick by altering the constant, 10, in lines 1010 and 1020; a larger value here will mean that the object will move less for a given movement of the joystick.

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Visiting Vic Video

Part 2 of a series

by Jim Butterfield

In which the traveller stakes a claim — but discovers he must first find empty land, and must subsequently register his address...

We know that the Vic-20 video chip gets two things from memory: screen memory and the character set. But it sees the computer's memory in an unusual way:

(figure here)

Suppose we want to lay out our own screen and characters. It seems simple enough: choose the locations for screen memory and character set, and POKE the block numbers (screen block times 16 plus character block) into address 36366.

If the screen is positioned at an exact block boundary, we put a low number (such as 22) into 36366. Otherwise we place a high number there (such as 22 plus 128, or 150). The 22, by the way, is for 22 columns — standard for the Vic.

We have two major tasks to do, however. First, we must make sure that the memory we are using to feed the video chip isn't needed by somebody else.

Second, we must tell the Vic operating system about our new screen location. Changing the video chip isn't enough — the parts of the computer that print to the screen must be told that the screen is somewhere else.

Let's try an example: we'd like to put our own character set into a tiny 5K Vic. Things will get a little crowded, since we need to use up 2K for the extra character set; but we can make it work.

Finding room

Almost all the spare RAM memory of the computer is assigned to Basic. This is to allow you to write programs as large as possible. We must take memory away from Basic to make room for the new video stuff.

Basic memory is a single continuous block. It goes from Start-of-Basic (whose address is logged in locations 43 and 44) to Limit-of-Basic (whose address is logged in locations 55 and 56). No breaks: you can't pop a screen in the middle and have Basic memory skip around it.

You can find the Start-of-Basic address on your machine by typing `PRINT PEEK(43) + PEEK(44)*256`; or the Limit-of-Basic address by typing `PRINT PEEK(55) + PEEK(56)*256`. Remember these; they are a good way to check the values after you've changed things around.

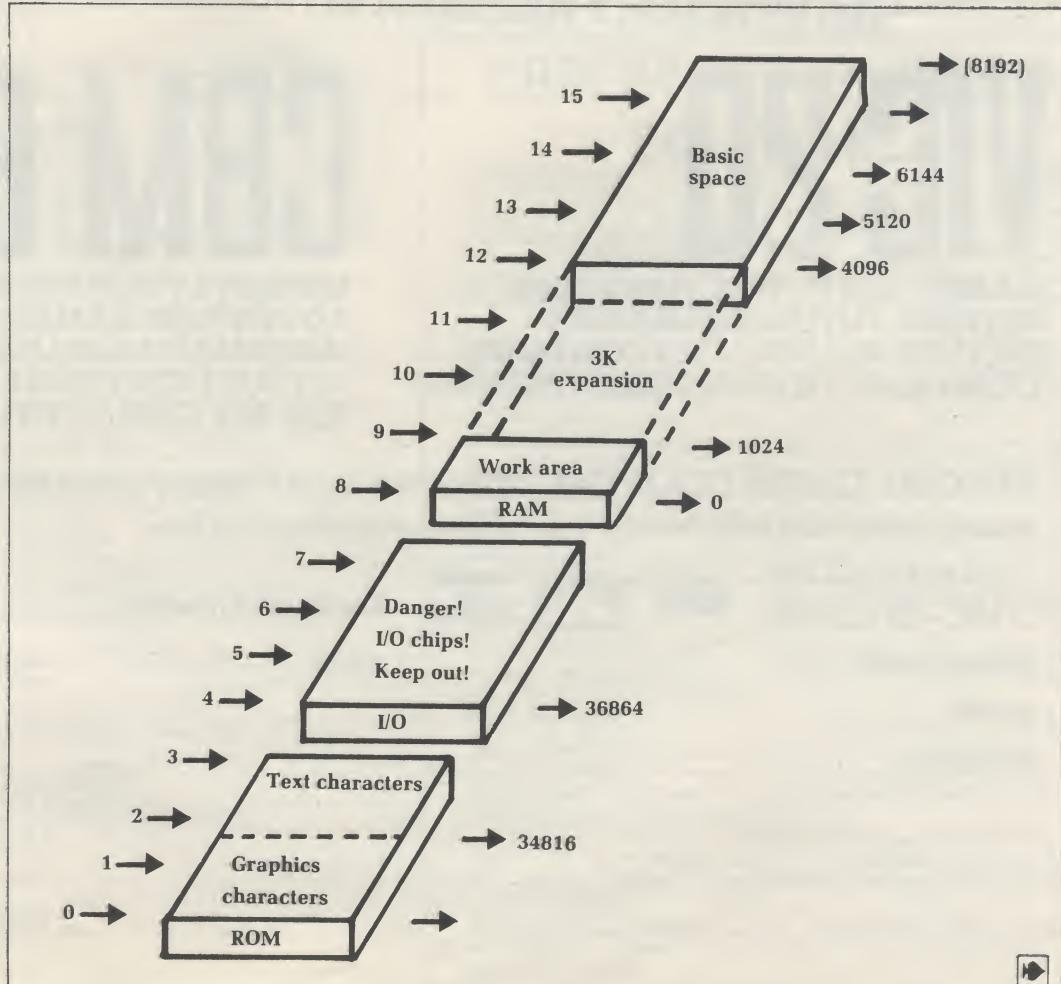
Making room

We have a choice. We can move down the Limit-of-Basic, which will give us room at the top. We can move up the Start-of-Basic, which will make room at the bottom. Or we can do both, if we don't like the extra work. Whatever we do, we must

realize that we're trimming back the area available for Basic.

If we move down the Limit-of-Basic, we must use CLR after we do so. This gets rid of variables and strings that might be in embarrassing places. **Don't forget this!**

Moving the Start-of-Basic upwards takes a good deal of care. Rule 1: we must POKE a value of zero into the first available location. Rule 2: we must set the Start-of-Basic pointer so that it points to the next location behind the zero. Rule 3: when we're finished, we



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must say NEW to make sure that Basic is cleanly set up in the new memory area.

How do we set up these pointers? Divide the desired address by 256: the remainder goes into the first byte, and the quotient into the second byte.

For example, say we want to move the Limit-of-Basic down to 6144. 6144 divided by 256 gives 24, with zero remainder... so we use **POKE 55,0:POKE 56,24:CLR**.

Another example: we want Basic to start at 5120. First, place the zero with **POKE 5120,0**. Now, the pointer must be set to 5121 (behind the zero); since 5121 divided by 256 gives 20 with a remainder of 1, we **POKE 43,1:POKE 44,20:NEW**.

Planning

We want to set up a complete character set, including the reverse characters. That will take 2K of memory — we could do it in 1K if we were willing to skip the reverse characters. Let's plan to put this at the top of memory, starting at block 14.

The screen takes up half a block, of course, and it seems to make sense to set this up just below the characters; so we'll pick block 13.5 (we can set the screen on a half-block 5632).

You may have noticed, by the way, that the Limit-of-Memory pointer is set one location beyond the last usable value. In other words, Basic can use 5631; but it can't use 5632, the Limit value.

Arithmetic time. 5632 divided by 256 gives 22 with zero remainder. So type:

POKE 55,0:POKE 56,22:CLR

...and the space is allocated. You can try PRINT FRE(0) and see what a puny amount of memory you have left.

We have not yet told the video chip to use this area. We're not yet ready to point the chip towards the new character set area; we haven't put any characters there yet.

So let's move characters in — but wait a moment. The new character set would go over top

of the present screen location. This would give us an odd looking screen.

We could live with that; but the screen would also do odd things like scrolling, which would move the character set we had so carefully placed. We'd better move the screen to a clear area first.

Moving the screen

The character set can remain as block zero for the moment; we'll want to shift the screen to block 13.5 with POKEs to 36869 and 36866. But we need to do two extra things at the same time — tell the computer system where to find the new screen, and clean up the screen area.

The POKEs to 36869 and 36866 tell the video chip all it needs to know about delivering the screen memory to the video output circuits. But unless we tell the computer system about the change, it will continue to put new characters into the old screen area. We tell it with a POKE to location 648.

Here's how the arithmetic goes. Divide the new screen memory address by 256, and POKE the result into address 648. Our example puts the screen at 5632, which gives 22 when divided by 256; so we'll POKE 648,22.

But we need to do everything together. Let's work out the other POKEs. The screen goes to block 13.5, and the character set remains at block for the moment. 13 times 16 plus 9 gives 208, so we'll need to POKE 36869,208. The half-block is logged into the system with POKE 36866,128 + 22, and so we move the screen with:

**POKE 648,22
POKE 36869, 208
POKE 36866,150
PRINT
PRINT CHR\$(147)**

CHR\$(147) is the clear-screen character, by the way.

Making characters

Now we can copy the character set from its fixed appearance in 32768 to our planned new area at 6144 and up.

If we copy the character set exactly, we've wasted a lot of memory — we'll get the same characters as before. To show we have control, we'll vary the normal character set slightly. Instead of the normal graphics set — upper case and graphics — we'll mix the two as we copy them over. Not too useful, perhaps, but when we cut over to the new character set, you'll be able to see that something new has happened.

```
100 FOR J = 0 TO 255 STEP  
    2  
110 J1 = J*8  
120 FOR K = 0 TO 7  
130 POKE J1 + K + 6144,  
    PEEK(J1 + K + 32768)  
140 NEXT K  
150 FOR K = 8 TO 15  
160 POKE J1 + K + 6144,  
    PEEK(J1 + K + 34816)  
170 NEXT K  
180 NEXT J
```

Run this (it will take a minute or two).

Telling the system

The screen has already been moved, and the character set is in place and ready to go. Let's cut it in, and the project will be complete.

The screen is still at block 13.5 and the new character set will be at block 14. So we do 13 times 16 plus 14 and get 222; we'll want to POKE 36869,222. Since we're not moving the screen this time, the 'half-block' value in 36866 is still good and we won't need to change that.

We're ready. Enter **POKE 36869,222**. Now try typing or listing the previous program, and look at the odd combination of characters we've created.

Summary

We must tie things together neatly — Basic, the operating system, the video chip — to make it all work properly. But with good planning, we can make the screen do marvellous things. More next issue!

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Graphics

The Graphics Primer — Part Three

by Kevin Smart

The multi-colour mode on the Vic is often described as a unique feature. It certainly can improve our programs.

The multi-colour mode was developed to overcome a disadvantage in high-resolution graphics. (I must stress that when discussing high-res graphics, I am talking about the features of the routine described last month: as yet, I do not know how colour is handled with the Super Expander cartridge.)

As on the ZX Spectrum, in normal/hi-res modes only two colours can be assigned to each dot in an 8x8 character. When the dot is lit it is coloured in the foreground colour and when not it is coloured with the background colour.

Unlike Spectrum, though, Vic handles this very nicely. We can actually have four colours per dot in each 8x8 character, thanks to the multi-colour mode.

The four colours we have access to are the screen colour (one of 16), border (one of eight), character colour (one of eight), and auxiliary colour (one of 16).

Unfortunately Vic giveth and taketh away. We gain the four colours at the sacrifice of our horizontal resolution (number of points) which is now halved to 88 dots.

This is well compensated by our ability now to colour dots in one of 16 colours instead of the normal eight. Multi-colour graphics can also be mixed with high-resolution and text anywhere on the screen.

Outside of PRINT statements, when we want to colour a specific item on the screen we usually POKE a value between 0 and 7 into the colour memory (which starts at location 38400 on the standard Vic-20. But if you POKE a number between 8 and 15, Vic is told to use multi-colour mode for that character space.

How does Vic know which colour to use for the dots? Let's look at an enlarged character (Figure 1).

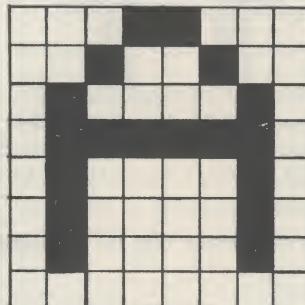


Figure 1

Remember when I told you that the horizontal resolution is halved. This means that in multi-colour mode the character is actually 8x4 although it occupies the same space as a normal 8x8 character.

So, in Figure 2 I've put the zeroes and ones in pairs. Vic looks at these pairs and for every combination it assigns a colour as shown in Figure 3. The resulting colours for an 'A' are shown in Figure 4.

You will probably know how to change the screen and border (POKE 36879,X) and the character colours, but most readers probably don't know how to change the auxiliary colour. The auxiliary colour reference is contained in register 36878. (Yes, that controls the volume for sound too!)

0	0	0	1	1	0	0	0
0	0	1	0	0	1	0	0
0	1	0	0	0	0	1	0
0	1	1	1	1	1	1	0
0	1	0	0	0	0	1	0
0	1	0	0	0	0	1	0
0	1	0	0	0	0	1	0
0	0	0	0	0	0	0	0

Figure 2

Using Figure 5 you may choose one of the colours from sixteen you wish to use. Then you POKE 36878, number from the table. If you are using sound as well, you must do this POKE 36878, 16* a number from table + volume level.

0	0	0	1	1	0	0	0
0	0	1	0	0	1	0	0
0	1	0	0	0	0	1	0
0	1	1	1	1	1	1	0
0	1	0	0	0	0	1	0
0	1	0	0	0	0	1	0
0	1	0	0	0	0	1	0
0	0	0	0	0	0	0	0

Figure 3

COMBINATION	COLOUR OF DOT
00	Screen colour
01	Border colour
10	Character colour
11	Auxiliary colour



The auxiliary colour is common to all characters: if you change the colour in the register all other auxiliary colour dots change. Special effects can be obtained from this feature.

Another useful location is 646. If you POKE this address with a number between 0 and 7 it functions like a colour control key. POKEing with a number between 8 and 15 tells Vic to use multi-colour mode.

DEMO 1 prints up the whole standard character set in multi-colour. On close observation you'll see that the characters are thicker and some dots have different colours. The component colours are as follows. Screen colour is black; border colour is white; auxiliary colour is light green; character colour is random.

B	B	A	A	Figure 4
B	B	A	A	
B	B	C	C	
B	B	C	C	
B	B	A	A	
B	B	A	A	
AA	= character colour			
BB	= border colour			
CC	= auxiliary colour			

only 8x4 dots and the pattern of dots in pairs decides on which

Auxiliary/Scheme	Character/Border
0 BLACK	BLACK
1 WHITE	WHITE
2 RED	RED
3 CYAN	CYAN
4 PURPLE	PURPLE
5 GREEN	GREEN
6 BLUE	BLUE
7 YELLOW	YELLOW
8 ORANGE	
9 lt. ORANGE	
10 PINK	
11 lt. CYAN	
12 lt. PURPLE	
13 lt. GREEN	
14 lt. BLUE	
14 lt. YELLOW	

Figure 5

The multi-colour mode character colour is obtained by adding 8 to the normal colour value of 0-7 — so red in multi-colour mode is obtained by POKEing the colour memory with $2 + 8 = 10$.

colour the pair will appear in.

This is how I recommend you should do it for the example of a Pac-Man character.

First, work out the shape of the character on a 8x4 grid (Figure 6).

How would you like to read text

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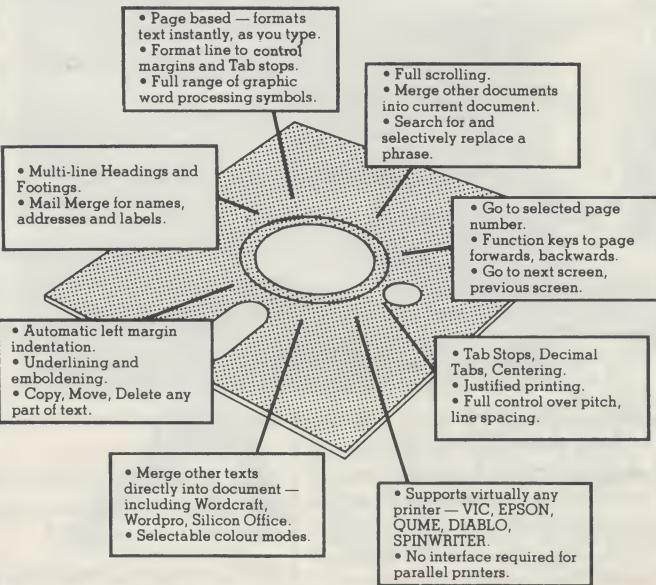
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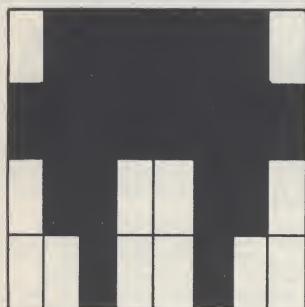


Figure 6

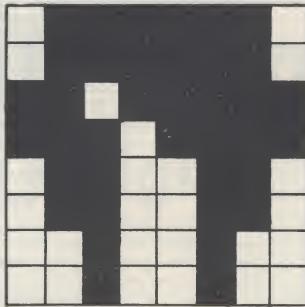


Figure 7

Now on an 8x8 grid replace the 'lit' dots with the specific colour control combination (Figure 3). The resulting character is shown in **Figure 7**. It does look strange at this point, but try **DEMO 2** to see the finished multi-colour character.

In **DEMO 2** you'll notice that the creature's eyes are coloured differently from its body while the actual background colour is different again.

DEMO 3 utilises the defined character to produce colourful patterns. Try placing other values between 0 and 255 in

line 100 to produce different patterns. Why not try the DATA for the Pac-man character here? Or try these:

```
100 DATA 175,175,175,175,  
     80,80,80,80  
100 DATA 227,227,22,22,73,  
     73,188,188
```

To produce good, colourful characters needs a lot of planning and experimentation. The more you experiment, the more experience you'll gain.

Next issue — an exclusive on moving the screen memory and Vic's answer to Atari's Player Missile Graphics.

```
0 REM *** DEMO 1 ***
1 POKE 36879,9
5 POKE 36878,16*13
10 FOR A=0 TO 255
20 POKE 7680+A,A
30 POKE 38400+A,RND(1)*8+8
40 NEXT

0 REM *** DEMO 2 ***
5 POKE 52,28: POKE 56,28: CLR: REM reserve 0.5K
10 FOR A=0 TO 33*8: POKE 7168+A,0: NEXT: REM clear memory
15 FOR A=0 TO 15: READ B
20 POKE 7168+A,B: NEXT: REM define two characters
25 POKE 36869,255: REM use new characters
30 POKE 36879,200: REM screen 1t purple, border black
35 POKE 36878,1*16: REM auxiliary colour white
40 PRINT CHR$(147): REM clear screen
45 FOR P=506 TO 0 STEP -1: POKE 7680+P,0: REM first
50 character on screen
55 POKE 38400+P,3+8: REM character colour cyan
60 GOSUB 200: POKE 7680+P,1: REM second character on
65 screen
70 GOSUB 200: POKE 7680+P,32: NEXT: GOTO 80: REM erase
75 character
80 FOR DELAY=0 TO 99: NEXT: RETURN
85 1000 DATA 12, 63, 251, 7, 15, 255, 63, 12: REM first
90 character
95 DATA 240, 60, 55, 11, 15, 63, 60, 240: REM second
100 character

0 REM *** DEMO 3: MOSAIC ***
5 PRINT CHR$(147): REM clear screen
10 FOR A=0 TO 7: READ B: POKE 7168+A,B: NEXT: REM produce
15 defined character
20 POKE 36869, 255: REM use custom graphics
25 FOR A=0 TO 506: POKE 7680+A,0: NEXT: REM fill screen
30 with characters
35 POKE 36879, RND(1)*256: REM random screen and border
40 colours
45 POKE 36878, INT(RND(1)*16)*16: REM random auxiliary
50 colour
55 FOR A=0 TO 506: POKE 38400+A, RND(1)*8+8: NEXT: REM
60 random character colour
65 GOTO 40
70 100 DATA 108, 178, 198, 27, 178, 108, 27, 198: REM data
75 for defined character
```

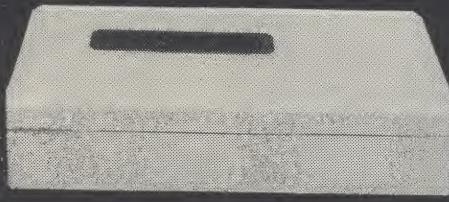
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All about memory a definitive insight

by Mike Todd

The way the Vic juggles its innards according to how much memory expansion you've got is a never-ending source of fascination. It has also caused more problems than I ever imagined it would.

I know it's been covered in many other places, including Vic Computing. And I know I've already discussed it in Todd's Lore. But I make no apology for returning to the subject, hopefully for the last time.

Figure 1 shows how the inside of the Vic look straight from the box, sans any memory expansion. Because it is like a 'map' of what's where in the Vic, it's called a *memory map*.

For the beginner, let me explain what this diagram means. First the Vic is capable of accessing a total of 65,536 locations, or bytes, of memory. Each is a storage location that can hold a number from 9 to 255 and nothing else.

Those bytes that can be altered by the user are called RAM (Random Access Memory); and those which are hard-wired at the factory when the Vic is manufactured are called ROM (Read Only Memory).

They can contain anything from the individual characters in a Basic program to the individual characters displayed on the screen, from the shapes of the characters as they appear on the screen to the machine-code instructions that the microprocessor at the heart of the Vic used to interpret Basic programs.

The Vic, using its built-in instructions, normally manages the contents of these bytes automatically. But there are two special commands available which allow the user to get at these locations directly:

X = PEEK(650) would put the content of memory location 650 into the variable X, while **POKE (650), 128** puts the number 128 into location 650.

Because these locations can't hold a value of more than 255, don't attempt to put anything than this into them or you'll get an **ILLEGAL QUANTITY ERROR** message. The same happens if you try to access a location greater than 65535.

Location 650 is actually used by the Vic to determine which key should repeat if it is held down. Its value is normally 0 (in which case only the cursor control keys will repeat); but giving it a value of '128' will make all keys repeat, and '64' will stop any key from repeating.



Inside the memory

Ok, so what does Figure 1 really mean? Well, locations 0 to 1023 are used to hold miscellaneous data, essential for use by the Vic itself. It utilises these locations as workspace, as we've just seen, and it is possible to PEEK at all these locations. It's best not to POKE to them unless you know what you're doing. It won't damage the Vic, but it could upset its working until it is turned off and on again.

The next 3,072 bytes (1024-4095) have no memory, and the next 3,584 bytes (4096-7679) are used to hold Basic programs and program variables. The storage of the Basic program currently in the Vic actually starts at location 4096.

The last 512 bytes (7680-8191) are used to hold the characters displayed on the screen.

In this memory, there is a one-to-one correspondence with the characters on the screen: location 7680 holds the character at top left, 7681 the next along...and so on until location 8185, which is the bottom-right screen position. (In fact there are six bytes not used between 8186 and 8191, but I wouldn't worry about them.)

The huge gap of 24,576 bytes from location 8192 to 32767 is followed by the character generator ROM. This contains the shapes of all characters that can be displayed on the screen.

It is possible to instruct the Vic to look for the character generator elsewhere than in this area. That is how you can redefine the character set, and through this produce high-resolution graphics.

The next 4096 bytes from 36864 to 40959 have a variety of specialised functions, including communicating with the outside world. The first section contains the input and output chips (or I/O chips); but the 1024 bytes from 37888 to 38911 are what we want to look at.

The first half of them is not used, in fact: but the 512 bytes from 38400 to 38911 contain the colours of the characters on the screen and correspond exactly with locations 7680-8191.

They are also slightly unusual in that they are not true bytes; they can only hold numbers from 0 to 15.

With this information, you could try some interesting experimental POKEs. This one, for instance:

**POKE 7680, 1:
POKE 38400, 0**

...you'll see a black letter 'A' appear at the top left of the screen. Change the second POKE to 1 and the 'A' will disappear; in fact you've just changed its colour — the letter

is still there but now it's the same colour as the background. Try:

PRINT PEEK(7680)

...and you should get the answer 1.

The 4096 bytes from 40960 to 49151 are 'empty' and it's from here that plug-in games cartridges are handled.

The last 16384 bytes hold the ROMs containing the instructions which allow the microprocessor to understand Basic programs.

This section is in two parts. The first is the coding which actually reads and executes the Basic program; the other section is known as the **Kernal** — it contains all the routines the Vic needs for communicating with the outside world.

Expansion

Now we're going to start to get a bit more complicated — let's add a 3K expansion pack and see what happens.

Figure 2 shows that locations 1024 to 4095 now have RAM in them and Basic programs start at location 1024.

Because we now have a lot more memory to play with, it is possible to start thinking about moving the character generator around.

I'm not going to go into the details here, as there are many sources of information on how to set up high-resolution graphics — not least of which is the current series by Kevin Smart. Suffice it to say that we need to reserve bytes at the upper end of the space for Basic: and this is done using POKEs to locations 50, 51, 55 and/or 56.

If this is not done, the Vic will assume that it has available all of the RAM up to the start of the screen — and it will proceed to utilise it, thereby destroying anything we've got in there. Those POKEs adjust some pointers used by the Vic to mark the upper limit of memory available for the program and thus prevents the Vic from trying to use them for itself.

It is also worth pointing out that the space allocated for high-resolution display and the screen must be within the 4096

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Todd's Lore

bytes of RAM built into the Vic — it cannot be in the expansion memory area.

More memory

This is the set-up assumed by most high-resolution graphics programs: and all is well until we add even more memory to the Vic.

Expansion cartridges other than the first 3K chunk of extra memory will fill up memory starting at location 8192. As soon as the Vic detects that there is RAM beyond this point it's all change to the set-up shown in Figure 3.

The changes are quite significant. The screen memory has moved to locations 4096 to 4607, colour memory is now 37888 to 38399, and Basic programs start at 4608. If there is any memory in the 3K expansion space it is ignored — you can still PEEK and POKE it, but it's not available for storing Basic programs in.

This is all very well, but where

can we put the character generator if we want to use hires graphics? It must be in that 4096-bytes block from 4096 to 8191, but Basic is using some of this. So it's no longer a simple matter of a couple of POKEs to move pointers about, because Basic programs start at this low end of memory and would be overwritten by the character generator.

To find the answer, let's see what happens when we use the Vic's Super Expander cartridge.

Using the Super Expander's GRAPHIC command in mode 1, 2 or 3 forces the Super Expander to move the Basic program out of the way. In fact it shifts it up to start at location 8192 and all variables are cleared in the process.

Any further use of the command has no effect on the Basic program once it has been moved.

At the same time the Super Expander puts the memory map

Reconfiguration

Here is Mike Todd's Reconfiguration program from the February issue of Vic Computing. It asks which configuration you want and whether or not you want the Super Expander in or out.

Running the program will reconfigure the Vic as if you had just switched on and so will erase the reconfiguration program itself. Also be aware that if you try to set up a configuration which has RAM missing (for instance, to +24K with only +16K RAM expansion) the program will do it: but you may be in trouble when trying to do anything with the Vic, especially when using strings.

```

100 PRINT"J"
110 PRINT"PRESS TO CONFIGURE AS"
120 PRINT"-----"
130 PRINT"0 EXISTING"
140 PRINT"1 UNEXPANDED"
150 PRINT"2 3K EXPANSION"
160 PRINT"3 +8K EXPANSION"
170 PRINT"4 +16K EXPANSION"
180 PRINT"5 +24K EXPANSION"
200 GET T$: IF T$<"0"OR T$>"5" THEN 200
210 C=VAL(T$): REM *** C IS THE CONFIGURATION NUMBER
220 OSUB 1000: REM *** SET UP CONFIGURATION VARIABLES
230 PRINT"CONFIGURING AS A VIC"
240 PRINT"WITH ";T$
250 PRINT"DO YOU WANT SUPER-"
260 PRINT"EXPANDER IN OR OUT?"
270 PRINT"(PRESS 1 OR 0)"
280 GET T$: IF T$ <> "1" AND T$ <> "0" THEN 330
290 GOTO 200: REM *** DO THE CONFIGURING
300 REM *** SET UP POKE VALUES (X, Y, Z)
310 REM *** AND SYS VALUE (Q)
320 FOR I=0 TO C: REM *** READ THE APPROPRIATE VALUES
330 READ X,Y,Z,T$:
340 NEXT I
350 RETURN
360 DATA 0,0,0,NO CHANGE
370 DATA 16,30,30,NO EXPANSION
380 DATA 4,30,30,3K EXPANSION
390 DATA 18,64,16,8K EXPANSION
400 DATA 18,96,16,16K EXPANSION
410 DATA 18,128,16,24K EXPANSION
420 REM *** DO THE CONFIGURATION
430 REM *** IF T$="1" SET UP TO INITIALISE VIA EXPANDER
440 IF T$="1" THEN Q=41031
450 REM *** IF T$="0" SET UP TO INITIALISE NORMALLY
460 REM *** AND DISCONNECT EXPANDER
470 IF T$="0" THEN Q=64824: SYS64824
480 IF C=0 THEN 220: REM *** DON'T SET NEW CONFIGURATION
490 POKE 641,0 POKE 642,X: REM *** SET NEW CONFIGURATION
500 POKE 643,0 POKE 644,Y
510 POKE 648,Z
520 SYS (Q): REM *** RE-INITIALISE THE VIC

```

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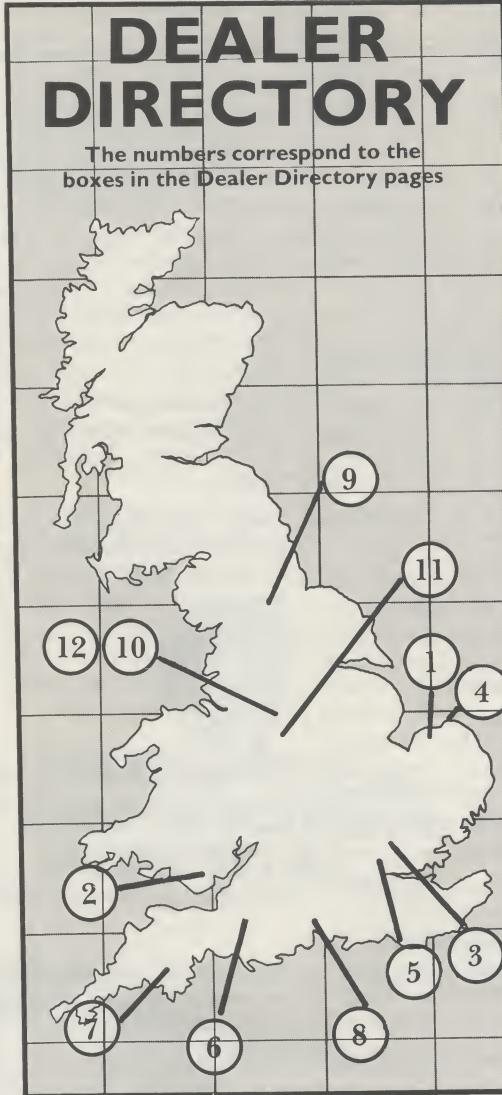
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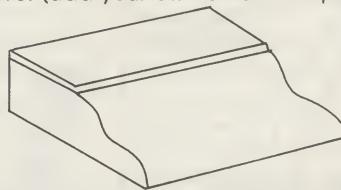
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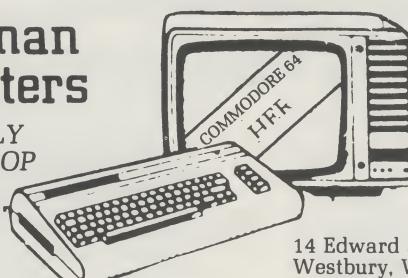
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back to what it would have been with no expansion — that is, with the screen and colour back at 7680 and 38400. All this is shown in Figure 4.

With this arrangement, it is possible to use exactly the same procedures to generate high-resolution graphics irrespective of the actual amount of memory available. Clever, isn't it?

Instant reconfiguration

Going back to Figure 3, which is what most people will have to cope with if they've added 8K RAM packs to the Vic, there are likely to be problems with programs that are intended for an unexpanded Vic or one with only 3K of extra memory. The reason is simply that few programs take into account the movability of the screen and will assume the memory maps of Figure 1 and 2.

For these programs, the Reconfiguration program I gave in February is suitable; it turns the memory map back to whichever is appropriate. Unfortunately, such reconfigurations do not allow the use of the extra memory at the same time as high-resolution graphics are being used.

Screen handling

Finally, while on the subject of high-resolution graphics, there is a limit to the size of the hi-res screen on the Vic. This is dictated by the amount of RAM available. As already mentioned, the Vic can only use the 4096 bytes of RAM between 4096 and 8191 (and not RAM expansion) for it.

Now, the normal screen requires 512 bytes allocated to it, leaving the remainder for the necessary redefinition of the character generator used to create the high-resolution graphics. This is a maximum of 3,584 bytes, or 28,672 bits — each bit being used to 'map' to a point on the screen.

The existing screen is 22 lines of 23 characters, a total of 506 characters — each of which is made up in an 8x8 grid of dots. So you would require 8x8x506 bits to fully represent a screenful of high-resolution graphics pictures: in other words, a total of 32,384 bits (that's 4,048 bytes). But as I've already stated the maximum possible is 28,672 bits (3,584 bytes) — so you can't even fill the existing 'window' with graphics! In fact, the practical maximum is about 441 (21x21) characters, or a total of 28,224 dots (which translates as 3,528 bytes).

Of course, it is not possible to fill the screen memory with 506 different characters. So a trick is needed: the display is set to use characters which are actually made up of 8x16 dots, in which case we only need to use 253 characters — but there's still the same number of dots.

Because it uses 136 bytes of the available RAM to store the character strings associated with the function keys, the Super Expander makes even less space available in memory — leaving only 3448 bytes for the high-resolution screen.

As a result, the screen shrinks slightly when using the GRAPHIC command. In fact it shrinks to 20x20 characters, or 160x160 (25,600) dots.

The technique used by the Super Expander is the solution. But it is no simple matter to get this to happen automatically from within a program without some machine-code programming. The reason is that we need to move the Basic program out of the way, but this we can't really do while the program is running.

On the other hand, with two POKEs and a SYS it is possible to set up the Vic to look like Figure 4 — so that any normal

LOAD will put Basic programs in the correct place. The instructions are:

**POKE 648,30; POKE 642,32:
SYS 64824**

... and I would suggest that they are all typed on the one line. The first POKE tells the Vic that the screen should start at 7680, the second that Basic programs should be stored from 8192 onwards; the SYS command enters the reset routines in the Vic's ROM which uses this information to set up the overall configuration of the Vic.

With this done, any graphics program written for the unexpanded or 3K expanded Vic should work — provided that any POKEs to locations 51 to 56 are deleted since they are no longer necessary. There is now no danger of the Vic overwriting the character generator with the Basic program or vice versa.

It is a simple task to add this option to my Reconfiguration program as Option 6 — the only alterations would be to add a line 190 in the menu, change the "5" in line 200 to "6" and add a new line 1015:

**1015 IF C = 6 THEN POKE
648,30: POKE 642,32:
SYS 64824**

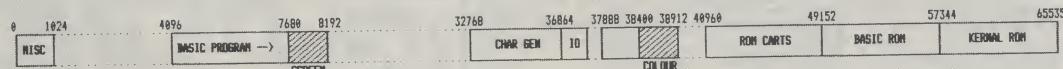


Figure 1: The unexpanded Vic

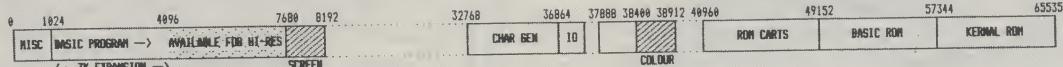


Figure 2: With 3K expansion

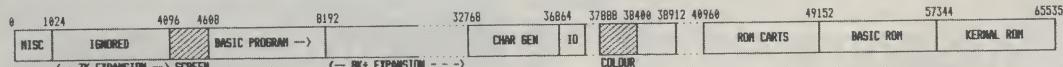


Figure 3: With 8K expansion

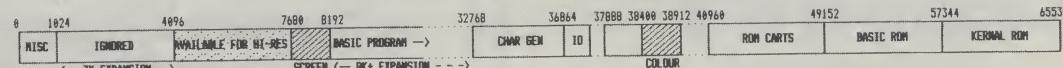


Figure 4: Reconfigured Vic

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Giant test: Games (and other programs) reviewed

by J D Collins

We've been building up another pile of Vic tapes and cartridges for Average Reader J D Collins to review — see his last batch complete with musings and criteria in our February issue. This time he took a total of 60 away with him, mostly games but also a few programming helpmates and a couple of 'home office' programs. (He returned them all in a large plastic sack marked SWAG.) And now read on...

A much better batch of games and things this time. The quality of programs has improved a lot, presumably because programmers are learning more about the Vic-20 and its capabilities.

You will no doubt have read other reviews of some of these games and found some difference of opinion as to their quality. That is inevitable, of course, so I tried to make my review of these programs comparative. After allowing for some difference in taste I hope that if you already have one or other of the programs I have reviewed you will be able to use my STAR RATING to judge the other programs. The only sure way to buy is still to ask for a demonstration in the shop.

Despite my comments in the February issue about the excess of Space Invader games I see there is still much to explore and develop in this genre. Other game scenarios have yet to develop the same macho appeal and exciting game structures. Perhaps the Spaze Zap scenario is not so restricted to the limits of what is known to be possible. I cite Quackers as a brilliant exception to this; the shooting gallery is a familiar game which has stood the ultimate test of time. It must have been

played for hundreds of years and always appeals.

There will no doubt be other realisations of such ancient games (shame I had no Chess games to review) and new ones to discover. We are going to see a lot of brave failures and a few outstanding successes as programmers explore the field and cruel capitalist economics takes its toll.

Changing times

The pace of change in the computer games field is worrying. I read that a new game has a life of only three months before it is superceded; at this rate my review is out of date before you have read it! Well, the microcomputer scene is heading into the realm of Future Shock at near light speed: so all we can do is hang on and enjoy the ride. Hello Tomorrow, here we come!

In the meantime you will have to think carefully about what you need and shop around. I think the big question is: should you get a disk drive? At present prices, is it worth

the cost?

For kids' use I would say not; but if you find you are hooked on the Vic and want to do more with it then you will have to have a disk. Start saving now!

Suppliers

I found all the Audiogenic cartridges hard to fit into the Vic; but my expansion board arrived in the nick of time and this seemed to make it much easier to fit the cartridges.

I was very impressed by the overall quality of the Sumlock range of cassettes; their robustness and reliability were excellent, not one failed to load. Sad to say I have not been very impressed by the educational programs in this batch, and generally speaking I am not impressed by many of the educational programs on the market for the Vic. I admit that an educational program has to use up valuable memory to structure the learning process and to display text for the students, so the highly distilled logic of Basic is not left with much space for exciting sonics

and graphics. Still, there is a lot of room for improvement in the field.

I hope that as more and more people get 16K expansion (and more) for the Vic-20, there will be a bigger market for more sophisticated educational software. I do wonder though if the programs around at the moment try to cram too much into their memory limits. Perhaps some compromise could be achieved and just one or two educational ideas be put into a 'game' format. Something like the Golf program reviewed here: as it is sold as a game you tend not to see the educational side, but it has easily as much educational content as Invisible Man.

Enough of the sermonising. Here is my top choice, which you can argue about all night if you like!

TOP FIVE GAMES

- ARCADIA
- QUACKERS
- ASTRO BLITZ
- CHOPLIFTER
- TOMB OF DREWAN

ADVENTURE PACK

STAR RATING ★★

These two games might have been better than I thought. But the lack of any details of their scenarios made it very hard to decide what to do, which is why I lost patience. Maybe that was supposed to be part of the Adventure; if so, dedicated Adventure players will probably find them a challenge.

Moon Base Alpha: you seem to be attempting to stop a meteor on collision course with your Moon Base, but the scenario was not explained so it could have been something else. I didn't get far enough into the game to find out.

Computer Adventure: I never did find out what this one was about as again I didn't get far enough into it to discover the plot.

Cassette; no expansion needed.
Price: £9.99. Supplier: Rabbit.

ALIEN SOCCER

STAR RATING ★★

Nothing to do with soccer, more a





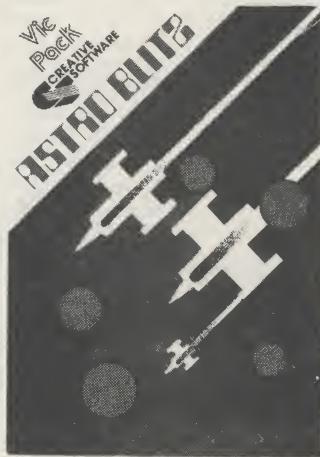
just me being stupid. Heartily recommended. Cartridge.

Price: £19.95. **Supplier:** Audiogenic

ASTRO FIGHTERS

STAR RATING ★★★★
Two-player game, one on keys the other on joystick. Each player has an Astro Fighter and must eliminate the other while avoiding cosmic obstacles such as Proton Stars. Shoot and thrust controls and ricochet effects create a fast and visually exciting game. Delicately defined hi-res graphics may be a problem on some TVs. A great game for two. Recommended. Cassette; no expansion needed.

Price: £6.95. **Supplier:** Sumlock.



pinball-type of game where the ball is deflected off various aliens into the goal which you must defend. Very clear graphics, good in black and white too: only moderate sonics, though. Impossibly fast at level five. Joystick, keys or paddle. Cassette; no expansion needed.

Price: £9.99. **Supplier:** Rabbit.

APPLE BUG AND CRAZY CLIMBER

STAR RATING ★★

Two games of 'magazine quality' but good value for money — especially for kids.

Apple Bug: your bug must eat the fruit in the maze and avoid the bug-eating worm. Nice clear graphics, good in black and white too.

Crazy Climber: clamber around the scaffolding collecting the flags as the scaffolding collapses about you. Deceptive cover illustration.

Cassette; no expansion needed.

Price: £5.95. **Supplier:** Lyversoft.

ARCADIA

STAR RATING ★★★★

Utterly excellent! Multifarious aliens swarm about you as you battle bravely against overwhelming odds. Modified Space Invaders format like you have never seen before — the screen positively explodes with my action! So do the sonics. (I did have loading problems with my first copy but true to their word Imagine replaced it by return post; I only mention this because I was very impressed by their sales service.) I think by now this game has a reputation that won't need any help from me but I think it is brilliant: Vic-20 games really come of age with this one. I only wish I had the special reviewer's copy so I could see what the upper-level aliens are like — I never got beyond the rainbow butterflies. Recommended, and how: A GOLD STAR award.

Cassette; no expansion needed.

Price: £5.50 (amazing value). **Supplier:** Imagine Software.

ASTRO BLITZ

STAR RATING ★★★★★

Joystick only

Scramble-type game: fly your ship over the planet's surface, blast those UFOs and ground installations. Excellent sound and ferocious graphics; good radar tracking device. Avoid the bombs and flying debris. Lovely clear display, even in black and white. The more I played it the more I liked it, though the High Score table confused me — I am sure that was

just me being stupid. Heartily recommended. Cartridge.

Price: £19.95. **Supplier:** Audiogenic

ASTRO FIGHTERS

STAR RATING ★★★★
Two-player game, one on keys the other on joystick. Each player has an Astro Fighter and must eliminate the other while avoiding cosmic obstacles such as Proton Stars. Shoot and thrust controls and ricochet effects create a fast and visually exciting game. Delicately defined hi-res graphics may be a problem on some TVs. A great game for two. Recommended. Cassette; no expansion needed.

Price: £6.95. **Supplier:** Sumlock.

AT THE CIRCUS

STAR RATING ★★

This educational program came to me without any instructions or manual which is unusual for Sumlock; I suppose it was an early issue. It was very well constructed as a learning exercise in simple arithmetic for kids; the sums are displayed as circus tricks and it asks various questions about how many performers there are. Correct answers are rewarded by an acrobatic display. In common with all the educational programs I have seen, though, I think it left a lot to be desired (with the honourable exception of Sky Maths and Space Division reviewed in February. Cassette; needs 16K expansion.

Price: £5.95. **Supplier:** Sumlock.

BONZO

STAR RATING ★★

Another Deutsche game, a Donkey Kong mutant. Willie the Workman has to collect the boxes on the various levels while avoiding the monster Bonzo. High-score feature. Nice clear graphics and good movement simulation, OK in black and white. Perhaps we have enough of this type of game? Still, a good version. Cassette; needs 8K expansion.

Price: £7.95. **Supplier:** Audiogenic.

CHOPLIFTER

STAR RATING ★★★★★

You are the pilot of a chopper rescuing the (American) hostages from you-know-where. Excellent graphics, very good sound, and a superb realisation of a helicopter in flight. You will find plenty of tricks to learn in controlling the chopper as you rescue the little men and dodge or blast the guardian tanks and jets. The loading instructions referred to an "interlace mode" which made no sense to me (it's an option that improves the quality of the display — Ed) but it didn't stop me running the game. Highly recommended. Joystick only. How long

before we see a cheap cassette version? (Probably never: it needs the extra memory you get in the cartridge — Ed.) Cartridge.

Price: £24.95. **Supplier:** Audiogenic

CHOPPER

STAR RATING ★★★★

You fly your helicopter between the mountain walks bombing the enemy tanks, missile launcher, convoys. Excellent sounds and a good simulation of the chopper: very hard to dodge the rocket attack. A very good game with fairly clever graphics — graphics are very clear, too. I liked it. Joystick or keys. Cassette; no expansion needed.

Price: £6.95. **Supplier:** Sumlock.

DESTROYER

STAR RATING ★★★

You must protect your Destroyer from submarine-launched mines and attacking planes. Fairly good, clear graphics; sonics only moderate. Radar scan feature. You have depth charges and rockets to defend yourself. Good in black and white. Keyboard only, which is tricky at first but once mastered gives a really good feel to the action. Cassette; no expansion needed.

Price: £6.95. **Supplier:** Sumlock.

GALACTIC CROSSFIRE

STAR RATING ★★

How long can you survive the Silgon phasers in a desert scenario? How long will you want to? Black blobs fire at you from the arid shrubbery. Apart from surviving there seemed little point to it all, apart from sheer speed. Clear but unexciting graphics, moderate sonics. Not one of Rabbit's best. Cassette; no expansion needed.

Price: £9.99. **Supplier:** Rabbit.

CHOPLIFTER

CARTRIDGE FOR USE WITH THE COMMODORE VIC-20®



GAMES PACK

STAR RATING ★★

Five games from Melbourne House — Alien (Space Invader variant); Invader (another one); Ground Attack (primitive Scramble, very poor); Space Rocks (Asteroids-type game, quite good — develop your skills in controlling your spaceship); and Storm (a better Invaders type of game with more interesting features). Overall I was not impressed: the individual games are a bit better than 'magazine quality', so I suppose the pack will be good value for the juniors — though kids these days are getting more sophisticated. Melbourne House will have to shape up, though, especially after they got such a high rating last time.

Cassette; no expansion needed.

Price: £5.95. **Supplier:** Melbourne House.

GOLF

STAR RATING ★★★

Golf simulation, loads hole by hole so follow the instructions carefully. This is an original idea with a good representation of the golf course which will require a lot of effort and practice to play well. You have to set your angle of shot an select the correct club for each obstacle, which makes for a complex game with plenty to think about each time you make a shot. Quite educational, too, despite the game format, as it entails careful choice and assessment of angles: so-called 'educational' programs could learn a lot from this one. Cassette; needs 3K expansion.

Price: £7.99. **Supplier:** Audiogenic.

GRIDTRAP

STAR RATING ★★★★

You must move around the grid defusing time bombs before they explode. Bonus points increase the score but you must dodge the BOOT or it will squash you! Not as easy as it sounds as you must plan your route carefully because you can not retrace your steps. Very clear graphics and a clever variation on a Maze theme. I liked it. Good sonics. Cassette; no expansion needed.

Price: £7.95. **Supplier:** Sumlock.

GUNFIGHT

STAR RATING ★★

One or two player option, joystick and/or keys. Shoot-out at the OK Corral scenario. Very clear but not very clever graphics. Ricochet effects can make it tricky; but I didn't find it such an exciting game. OK if you have cowboy fantasies. Cassette; no expansion needed.

Price: £7.95. **Supplier:** Sumlock.

HOPPER

STAR RATING ★★★

Classic Frogger game, instructions on packaging and in program. Loading is more complex than the Sumlock version though the graphics were in many respects clearer (OK in black and white too). Good sound and a time penalty add spice to the game. Joystick only. Cassette; no expansion needed.

Price: £9.99. **Supplier:** Rabbit.

INKOSI

STAR RATING ★★

Only two stars, but a bit better than Metrics by the same people. The graphics are about equal to the graphic Adventures reviewed here — lo-res but not too bad. You are the Chief of an African tribe and must help your people survive the problems of subsistence farming. Actually fairly good once you have got into it; but I only award two stars because the instructions on screen were, in my opinion, too confusing for the juniors without a lot of help from teacher. I am not at all sure that the scenario will be so interesting for a generation of kids used to the farthest reaches of Space and the battles of the Giants. Chalksoft say their programs are "fully-tested" in the classroom: I can only assume the test was not conducted in the kind of disadvantaged schools I have experience of. Sorry to be so sceptical. For ages 10 to adult, I agree, with reservations about the scenario. Cassette; needs 3K expansion.

Price: £5.95. **Supplier:** Chalksoft.

INVISIBLE MAN

STAR RATING ★★★

Teaches Cartesian geometry by displaying a grid and the Invisible Man.

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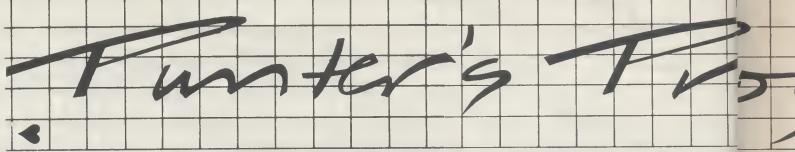
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then asks you to key in the co-ordinates to discover him. Clues are given for the direction you should take to locate the co-ordinates: the screen shows your path taken in your travels around the grid. As you may have realised it is a sort of Battleship game. Much better than Chalksoft's other efforts — the instructions on screen are easy to follow and the program was well protected against twits like me who like to press all the wrong keys. Three levels of difficulty. For ages seven to 14, though I think the scenario will be a bit unexciting for 14-year-olds. Cassette; needs 3K expansion.

Price: £9.99. Supplier: Commodore.

questions after two false responses and I did have a few loading problems. See if you can spot the 'Lie Index' questions! Cassette; needs 8K or 16K expansion.

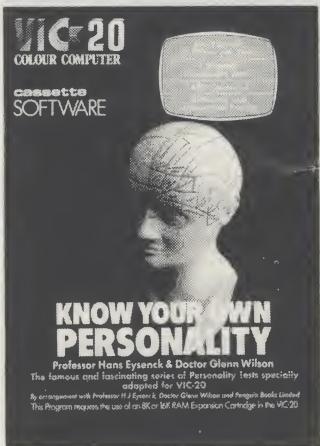
Price: £9.99. Supplier: Commodore.

LUNAR RESCUE

STAR RATING ★★

You must guide the Rescue Pod from the Mother Ship to the lunar surface to rescue trapped personnel. Nice clear graphics, and harder than it looks at first. Instructions in the program; but the loading was a bit fiddly. Cassette; no expansion needed.

Price: £5.95. Supplier: Lyversoft.



JUMPIN' JACK

STAR RATING ★★★

Classic Frogger-type game which will hold no secrets if you have one already but a very good version to check out if you haven't. Bright multi-colour graphics and lots of action. Good sound, too. A faultless loader and had a nice professional feel to it in use. Joystick or keyboard. Cassette; no expansion needed.

Price: £7.95. Supplier: Sumlock.

KAKTUS

STAR RATING ★★

You are a home-loving gopher (something like a cross between a hamster and a mole, I think) desperately trying to save your favourite cactus from swarms of ravenous wasps and hornets. Like all hi-tech gophers, you have a directed energy weapon to do battle with against flying nasties. A novel variation on the Space Zap type of game with deadly acid drops and an enemy mole to make it all the harder to protect your beloved plant. Unfortunately I did not find the graphics so clear, which made Wasps and Hornets hard to distinguish; and all in all I did not find defending a prickly plant to be such an exciting scenario. Cassette; needs 8K expansion.

Price: £7.95. Supplier: Audiogenic.

KNOW YOUR OWN PERSONALITY

STAR RATING ★★★★

Well, now we get down to the real nitty gritty, eh? Isn't this what you thought Computers were all about? The answer is both yes and no; though this is certainly a well-constructed program which puts Profs. Eysenck and Wilson's classic personality test into the hands of the People. I do have a few reservations and I am sure psychologists all over the world will too (and computer magazine editors as well — Ed).

First, despite the tone of the manual Eysenck's theories of the human personality are not the only ones around: and no matter how good the statistical validation you can still argue whether his 'constucts' are appropriate in the first place. Beware of labels! Psychometrics are not everything.

Second, even if you are a student of psychology (and perhaps more importantly if you are not), the manual does not give nearly enough data on the development of this test. So you are using it in almost complete ignorance of the problems and values involved. Take with a pinch of salt!

Having issued my warnings I welcome this program as the beginnings of home computer use in intimate human affairs and I am pleased that it has at last been brought more or less up to date. It is by the way great fun to use; but you lose the

MANGROVE

STAR RATING ★★★★

Not one of Audiogenic's better efforts;

you have the unexciting task of

protecting your colony of cells from

invading microbes. Graphics and sonics

barely moderate. Cassette; no

expansion needed.

Price: £7.95. Supplier: Audiogenic.

METRICS

STAR RATING ★★★

Metrics is a set of five programs designed to instruct and test knowledge of the metric system for volume, length, capacity, area and mass. I hate to be critical; but then that is what I am here for, so here goes. I had a lot of loading problems, which chalksoft say could have been due to non-standard memory packs — I use the Commodore RAM cartridge, so maybe I got a rogue tape. In any case I can see the program's first screen display, about the memory size needed, causing endless confusion to an unsupervised class of schoolkids unless they know how to handle the Vic-20.

Once in action the multiple-choice questions were quite good; but on the whole I found it a bit boring. I know a lot of teachers who would give an arm and a leg for a computer program that would help them and their pupils to understand and practice skills in mathematics; sadly I don't think this is the program. It has been a long time since I was in the teaching game but I do not think this would have been as much use to me as Chalksoft claims.

For ages 10 to 16 in theory; I'd say up to 13.

Cassette; needs 3K expansion.

Price: £9.95. Supplier: Chalksoft.

MULTITRON

STAR RATING ★★★★★

Superb modified Space Invader type game. Six alien forms in varied attack

Progress

formations and really clear hi-res graphics descend upon your phaser base. Clever aliens can avoid your phasers, and an energy limit on your phaser adds a time penalty — so don't get carried away by the swirl patterns you can make with your only weapon. Good sonics. Was the Space Turtle meant to add a touch of humour or was that just my reaction? Best version of this type of game I've seen. Joystick or keys. Cassette; no expansion needed. Price: £7.95. Supplier: Sumlock.

MYRIAD

STAR RATING ★★★★

Space Zap style of game with nine types of aliens. You have two types of armament (Photon blaster and force field) to protect you from the aliens and asteroids — use the force field with care as it inhibits your photon blaster. Scoring is a bit confusing at first and the black background makes some of the graphics a bit murky; but it's a very good game — almost as good as "Arcadia" for action. Cassette; needs 3K expansion. Price: £9.99. Supplier: Rabbit.



NIGHT CRAWLER

STAR RATING ★★★★

A very good combination of Pacman and Space Invader formats. Venture into the forest and survive the deadly inhabitants, especially the Night Crawler. Very clear graphics, though there was a murky blue thing that got me most of the time. Joystick only. There are 39 levels to play through, and level 39 is fast beyond belief! Cassette; no expansion needed. Price: £9.99. Supplier: Rabbit.

OMEGA RACE

STAR RATING ★★★★★

You must take part in the Omega Race, a training scheme for the aspiring Space Defence Corps people of the Omegan system (the finest such outfit in the Galaxy): you fight against android attack craft of various kinds scoring points as you go. Excellent graphics and good sonics make for a superb game. You have choice of joystick or paddle, and choice of background and ship colour (at last!). Control of your ship is very hard to master as it whirls about in space dodging and attacking. Lots of room to develop your skills. I was fascinated by this game, but quite useless at it: I'm told our esteemed Editor has made it into the Omega Corps (true — Ed): filthy Klingons beware! How soon before we see a cheap tape version? (Never — Ed.) Cartridge. Price: £24.95. Supplier: Commodore.

PIT

STAR RATING ★★

Fresh and untranslated from Germany this cute little game will help you

practice your Deutsch. To be serious, the German instructions on screen may confuse the little ones but it is all in English on the cassette cover. Hans the Handyman has to collect sacks of gold (Rhinegold?) and get them back home dodging the acid rain. Poor sonics, moderate but clear graphics. All right for kids. Cassette; no expansion needed. Price: £7.95. Supplier: Audiogenic.

QUACKERS

STAR RATING ★★★★★

Roll up! Roll up! All the fun of the fair! Superb realisation of a fairground shooting gallery. Excellent sonics, good graphics which are so appropriate. Bar chart time indicator, four lines of targets plus dancing turtle. That last grinning melon is so hard to hit! I played with this one for ages: great fun. A Gold Star award! Joystick only. Cassette; no expansion needed. Price: £9.99. Supplier: Rabbit.

SCORPION

STAR RATING ★★★

Destroy or dodge deadly scorpions and spider in a desert scenario. Very fast modified Space Invaders format: desert cacti emit deadly spores to make it even harder. Certainly a good game for fast reactions and high scores, though the scorpions were a bit murky. Joystick or keys. Cassette; no expansion needed. Price: £7.95. Supplier: Sumlock.

SERPENTINE

STAR RATING ★★★

Maze-type gobbler game. Help your blue serpent to survive and multiply as you eat the frogs and dodge or eat the cannibalistic red serpents. Appropriate serpentine music and an original concept make for quite a good game. Tricky to play, can be hard work on the joystick. Joystick only. Cartridge. Price: £24.95. Supplier: Audiogenic.

SKRAMBLE

STAR RATING ★★★★

Very good version of this classic game, and a faultless loader (as were all the Sumlock games). Will need a good TV (and it's not good in black and white) but the graphics were the most delicately defined shapes I have seen so far and the colour contrast was good too. Very well packaged and a pleasure to use. Joystick or keyboard. Cassette; no expansion needed. Price: £7.95. Supplier: Sumlock.

SKRAMBLE

STAR RATING ★★★

Classic Scramble game. Slightly chunkier graphics will make this game more suited to older TV sets. Still a good version to consider. Cassette; no expansion needed. Price: £9.99. Supplier: Rabbit.

SPACE ASSAULT

STAR RATING ★

Scramble-type game: unexcitingly coloured graphics were quite detailed and very clear, but I found the loading a bit fiddly and the game rather slow to play. I can't really recommend this game as there are so many other versions to choose from. Cheap at the price I suppose. Keyboard only. Cassette; needs 3K or 8K expansion. Price: £5.95. Supplier: Lyversoft.

SPACE BOMBER and MAN ON THE RUN

STAR RATING ★★

Space Bomber: protect your storage complex from a Space Invader type attack. Simple but clear graphics, faster on keys. Good in black and white.

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Funtor's Progress

Man On The Run: captured by The Master you must do battle against his aliens in a gladiatorial arena. Good sonics, faster on keys.

Mainly for the juniors I think as there are so many more sophisticated versions of these games around. Cassette; no expansion needed.

Price: £6.95. Supplier: Sumlock.

SPACE PHREES

STAR RATING ★★

Another Space Invader style game with swirly attack patterns. Graphics were only partly in hi-res, though nice and clear; sound effects moderate. Not as good as many on the market. Cassette; no expansion needed.

Price: £9.99. Supplier: Rabbit.

SPACE RESCUE

STAR RATING ★★★

Rescue the survey team from the planet's surface with your shuttle craft, dodging or lasering the meteors on the way. Good sonics, clear graphics, good in black and white. High-score feature. If you get too eager a curious purple bug gets into the program. Cassette; no expansion needed.

Price: £6.95. Supplier: Sumlock.

SPIDERS OF MARS

STAR RATING ★★★

Your Cosmic Fly does battle against the denizens of Red Planet: it's a Scramble-type game. Sonics only moderate; clever graphics, but colour clarity left a lot to be desired — especially at the higher levels, which was a great pity as it would have been useless on my old ex-rental TV: otherwise it would have been an excellent game. A choice of colours with skill level shown numerically (as in Omega Race) should have been used. Nine skill levels to play through, level nine being impossible. Lower Star Rating because of the colour problem. Cartridge.

Price: £19.95. Supplier: Audiogenic.

STAR BATTLE

STAR RATING ★★★

Classic Space Invaders game with few frills. Graphics clear, sonics moderate, scoring a bit murky. No choice of colours. Although it is a very good version of the game, and superbly packaged as always by Commodore, I honestly don't think it is worth the cost considering the many cheaper cassette versions around. Cartridge.

Price: £24.95 (but now being sold cheaper in some shops). Supplier: Commodore.

STARSHIP ESCAPE

STAR RATING ★★★

Graphic Adventure game in hi-res. The graphics sometimes reduces the size of the screen display, which is inevitable I suppose (see our reviews of the Pixel/Quicksilva Adventures). On patrol in deepest space you are captured by a Force Cloud Entity who disassembles your space craft and hides the bits around its own ship. You have to explore the Entity's craft and reassemble your spaceship to escape, aided only by your laser and your faithful robot. There are various alien guards to defeat and hints if you get stuck. Loads in one go which is an advantage. At the moment I am stuck at stage two! Good sonics. Good value; I liked it. But there does not seem to be any 'save game' facility on this one, which is a shame. Joystick or keys. Cassette; needs 16K expansion.

Price: £9.95. Supplier: Sumlock.

SUBSPACE STRIKER

STAR RATING ★★

You are the captain of the Subspace Striker 'Swordfish' determined to disrupt the nasty Federation's space lanes. You pop in and out of sub-space to harass the foe and/or dodge the deadly fighters and sub-space mines. Does that all sound vaguely familiar? Lots of nice full-screen lo-res graphics and the occasional hi-res stuff too, and just the kind of scenario I like; perhaps that is why I was a bit disappointed. Somehow it didn't have quite the pace I expected. Still, quite good value for the price. Maybe I too critical of sci-fi games — being a sci-fi fanatic I always hope for so much. Cassette; needs 16K expansion. Price: £9.50. Supplier: Quicksilva.

TANK ATAK

STAR RATING ★★★

You are the only surviving tank on the battle field and must protect your country from the invaders. Hit the enemy tanks and missiles, and zap the enemy reconnaissance UFO too. Novel display of attacking forces will be a change for the Space Zap fans, but on the whole I did not find it such an exciting game. Cartridge.

Price: £19.95. Supplier: Audiogenic.

TANK WAR

STAR RATING ★★

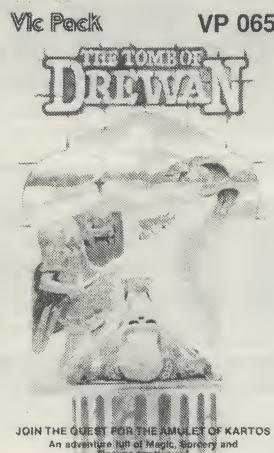
Steer your tank around the maze and blast your opponent: one or two player option, joystick or keys. Screen instructions a bit murky; but it's all repeated on Rabbit's excellent packaging. Sonics are fine but the screen display is not so good — the colour contrast between maze and background is poor. Cassette; no expansion needed.

Price £9.99. Supplier: Rabbit.

TOMB OF DREWAN

STAR RATING ★★★★

Superbly packaged, hugely complex Adventure game with graphics: 400 (!) chambers to get through. Excellent scenario sets the scene for your search for the fabled Amulet of Kartos. Only you can save the world from the triumph of Evil as you battle against scores of vile magical foes with an arsenal of mystical and material weapons, all graded according to potency. As a novice in Adventure games I couldn't hope to do real justice to this one: but I was certainly impressed, definitely for one of those long winter evenings. Maybe it could have been better without the



VIC Music System



graphics if you have a good imagination: but then it would not be the same kind of game. Keyboard only. Can I keep it? (Maybe — Ed.) Cassette; needs 16K expansion.

Price: £12.95. Supplier: Audiogenic.

TRADER

STAR RATING ★★★

A 48K graphic Adventure game that loads and runs in three 16K stages. Sci-fi scenario with a rather laid back manual that has raised an eyebrow with other reviewers — though I can't think why, as it seems quite in keeping with modern sci-fi and was really very friendly. You are a trader in the Meridian system flogging your wares to a motley bunch of locals on various planets. Will you make a profit? Will you make it back alive? The graphic style is unusual in that most of it is what I can only call lo-res, but it is the best low-resolution stuff I've seen and was quite effective in action. I especially liked the Hydrosilicon Psions, though their manner was a bit cool; and the Space Port on Delta bore a worrying resemblance to a rather seedy part of lower Manhattan that I once had the misfortune to discover (if only I'd known then what I know now courtesy of Trader) — it even had Juice Bars!

My only criticism? You are allowed to go on to the next stage of the game even if you made a real booboo of the preceding part; maybe I was better than I thought, or it could have had something to do with the continuity of variables through the stages. I must be honest — I did get cast out twice by the Psions and had to start again, even though I used my calculator.

Pixel wrote the package, but all Pixel games are now being distributed by Quicksilva. Cassette; needs 16K expansion.

Price: £18.50. Supplier: Quicksilva.

TRASHMAN

STAR RATING ★★

Maze-type game. Drive your trash truck around your city collecting the garbage and crushing the mutant flies. Sonics only moderate and graphics a bit murky. Tricky game to get high scores on: but then what game isn't? Not an exciting scenario. Not worth the cost. Cartridge.

Price: £19.95. Supplier: Audiogenic.

TRIAD

STAR RATING ★★★★

Fast and powerful Space Invaders with demonstration game. Bright and clear graphics and scoring with good sonics. One of the best versions of this game. I liked it. Joystick or keys. Cassette: no expansion needed.

Price: £7.95. Supplier: Sumlock.

VIC MUSIC SYSTEM

STAR RATING ★★★

Ever so complex music-writing system for the musically literate (not me) or those keen to practise their skills. Comes complete with sample music data file and data to enter to see how it works. Very clear screen display. The tonal quality seems fixed, so don't think of it as a music synthesizer; it is more of a learning aid. Menu-driven, uses three voices. I found it easy to use as directed in the examples: and if I had had more time I'm sure I could have learned quite a lot about musical notation and done it more justice in this short review. But in my humble opinion I'd say it is a good program for those learning music at school, perhaps not so good for those who are already able to write and play music at say 'A' level standard. The blurb that came with the program did not claim it to be 'educational', perhaps because the word has such dreary connotations, but it does combine the educational with the fun uses in equal measure. I liked it. If I had musically inclined kids I'd say about £15 was the maximum I would pay; anything less would make it really good value. Cassette; needs 16K expansion.

Price: £15. Supplier: Simmons Magee.

VIXEL

STAR RATING ★★

Amusing little number combining a magazine and cassette with three games — Fire (rescue the people in the burning buildings); Draw (draw your own pictures and save them on tape); Race (race your car around the track against Vic's car). Details of variables used in the games are explained in the magazine so it could be fun for the amateur programmer, but the games are only 'magazine quality'. I don't think a star rating is really appropriate. Oh well, all right then: star rating **. Cassette; no expansion needed.

Price: £9.95 per issue (more to come). Supplier: Audiogenic.

WACKY WAITERS

STAR RATING ★★★★

Very novel idea: you are the waiter in a very busy restaurant dashing about up and down the service lifts to satisfy the customers. It is so difficult to get good staff these days! A very well constructed game which is a real challenge to play for high scores. My only criticism is that the graphics are sometimes a bit murky on the black background. Friendly introduction on the cover sets the scenario most amusingly. Excellent value for money. Cassette; no expansion needed.

Price: £5.50. Supplier: Imagine Software.

THE WIZARD AND THE PRINCESS

STAR RATING ★★★

Multi-stage graphic Adventure game, one of the new type of Adventure games appearing on the market for the Vic. Naturally you have to rescue the Princess (which may or may not appeal depending on your sex and your sexual orientation — Ed.) Through the Old Forest you to the Castle Perilous and on to darker and deeper Adventures! Good sonics, very atmospheric: most interesting. At least as good as the other graphic Adventures considering the memory limit. Not a fast game but fun to play. Cassette, no expansion needed.

Price £5.95. Supplier: Melbourne House.

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Tommy's Tips

Dear Tommy, Can you let me know the possible values and meanings of the variable 'ST' when using the cassette and the RS232 user port? Are there are other useful system variables?

The possible values of ST can best be expressed in the form of a table:

ST value	Cassette	RS232
1		Parity Error
2		Framing Error
4	Short Block	Receiver overrun
8	Long Block	—
16	Read Error	CTS missing
32	Checksum Error	—
64	End of file	DSR missing
-128	End of tape	Break detected

Other reserved variables are TI and TI\$, which are time variables. TI gives the number of 'jiffies'; it is useful for

measuring the time taken for a routine to execute, say, or for the user to reply to a question. TI\$ gives the time in hours, minutes and seconds. Both TI and TI\$ start from zero when you turn your Vic on, or can be reset by TI\$ = "000000".

Incidentally, ST is a disk status variable; you had best

refer to the disk manual if you want to know all about its values, because there are rather a lot of them!

Dear Tommy, Can you please confirm if it is normal for the computer to cause a TV to buzz and the tone of the buzz to change as the computer is working? Also, is it normal for the RAM to empty itself after a short while if the computer is left switched on but untouched?

In theory the Vic should produce no noise when connected to a TV (unless you use the sound generators of course!); in practice, however, there is usually a certain amount of background buzz — though it should not be so loud as to be annoying.

The most likely cause is that your TV is not tuned in accurately to the Vic, so try adjusting this. If you cannot get rid of the buzz, there may be a fault in the Vic or the TV. So try the Vic on another set to see how that works. If the set is an old one, the filters which separate the sound and video signals may not be up to scratch, allowing this 'video buzz' to come through. If the same fault occurs on another set, you should take the Vic back to your dealer and ask him to have a look at it.

If your Vic is losing programs as you say, then it is probably faulty anyway. On the other hand the problem may be a 'dirty' mains supply. If there is a large amount of interference on the mains — from an adjacent factory, from a lift if you live in a block of flats, or even an electric kettle or drill — this can cause the Vic to crash. If the interference is coming from outside, you may be able to get the CEGB to do something about it.

You can buy special filters and transformers, but these tend to be rather expensive I am afraid.

Dear Tommy, Sometimes if I test-run a program while I am in the middle of entering it, it turns into a few numbers and a lot of words that mean nothing, e.g.

11362

12874 CLOSE: CLOSE: CLOSE

Other times there are a couple of lines of Basic then the 'funny'. Please could you tell me why this is happening and how to correct it as it is very annoying!

This does sound rather like a memory fault on your Vic, assuming that you are not doing any naughty POKEs which are going wrong. The best thing to do is to run a memory test program: your dealer should be able to do this if you haven't got one.

If you want to get a program back after this (although of course you should have saved it before running it!) you might get away with typing a line number as though you were deleting a line. For example, if you are not using line number 1, typing a 1 and pressing RETURN may work. This isn't a foolproof method, but it does sometimes work.

Dear Tommy, Please consider the following:

10 PRINT POS(X): GOTO100

This yields values between 0 and approximately 40, instead of values between 0 and 21 as described in the notorious User Manual (page 132). Why is that so?

Try this little program:

```
100 SP$ = "
SP$ = SP$ + SP$
110 FOR I = 1 TO 90: PRINT
LEFT$(SP$,I); POS(I): NEXT
```

This shows the value of POS(I) going up to 87! What is in fact happening is that one 'logical' line as far as the Vic is concerned can extend over four 'physical' lines on the screen, giving you 88 columns numbered 0 to 87. This means that you can have Basic program lines, for example, longer than the width of the screen.

Dear Tommy, I have a program which contains a large number of tables which I use to look up abbreviations. However I have a problem which I believe is due to "garbage collection", where the Vic goes dead for a couple of seconds. Can you explain exactly what is happening?

Garbage collection is a feature of many versions of the Basic language, and occurs because of the way strings are stored.

The Microsoft Basic on the Vic has an extremely powerful string handling capability, where any string can vary in length between 0 and 255 characters. This makes it uneconomical in terms of memory space to allocate a fixed area of memory to each string; so what happens is that an area of memory is allocated in which to store all the strings used by the program. This runs from the end of the array storage area up to the top of memory.

If a program contains a statement A\$ = "FRED", the four characters F, R, E and D are stored at the top of the string space. Another statement B\$ = "BILL" causes B, I, L and L to be stored just below the FRED. In each case, the entry for A\$ or B\$ in the variable table contains a pointer to the corresponding text in string space.

If the program now finds another assignment to A\$, say A\$ = "ARTHUR", it will throw away the old value of A\$ ("FRED") and put ARTHUR just below BILL, changing the pointer in the variable table to suit.

The old text remains in the string space as garbage because it would take too long to search the string data for a gap large enough to store the new value. In this way, the string data moves down through memory until the string space is full.

At this point the garbage collector is called in and the Vic goes dead while it throws out all the garbage and frees space for more strings.

If there is still not enough room, the Basic program will stop with an OUT OF MEMORY error.

You can cut down the time taken for each garbage collection by cutting down on the number of strings in the program, especially large string arrays.

Tommy is our resident technical expert. All the technical queries we get on the Vic are passed straight on to him, and nearly all of them will get a reply — usually in this column of the magazine rather than a personal missive, though you might just be lucky.

"The only reference guide available" says the blurb for the 'corrected and revised' second edition of Nick Hampshire's Vic-20 sourcebook, *Vic Revealed*. That quote came from Mike Todd, and he was somewhat miffed to discover it on the book's new dustjacket — it's out of date, but more important it's out of context.

A paperback that promises you the "innermost secrets" of the Vic for £9.95 sounds like a good deal, though. So we asked Mike to take a look at the new version.

Following the poor reception that the first edition received in some quarters, I was pleased to have a chance to see the second with its bold claim on the front that it is "corrected and revised".

But, sad to say, the second edition is very little different to the first with only a small proportion of errors corrected.

What you get

For those who don't know what's in *Vic Revealed*, let me take you through the book chapter by chapter.

Chapter 1 describes the 6502 microprocessor, the way it works, its internal structure, its instruction set and the problems associated with writing machine code on the Vic. The 6502 instructions are introduced as assembler mnemonics (which are an easier way of writing in machine code compared with working byte by byte); and it shows quite well a method of hand-converting a program written in mnemonics into hex codes suitable for the Vic.

There's even a short Basic program which allows machine code in hex to be loaded into the Vic. Well, I say 'into the Vic'; but the hex program that is given is actually for the Commodore Pet and will not work on the Vic, although the 'loader' section of the program could be used.

Speaking of hex, this notation is a great help for machine code programmers and is fairly easy to pick up. Unfortunately the book fails to describe hex in any detail — although it uses it extensively. At least there's a table to convert decimal to hex in an appendix, of which more later.

Revelations 'Vic Revealed' Reviewed By Mike Todd

Turning to chapter 2 we are given a general tour of the innards of the Vic, complete with memory maps. There is a useful dissertation here on what each section of memory is used for and a ten-page table with the obligatory list of memory locations and what they are used for.

Like much of the book, this table is poorly presented and contains inaccuracies, but it could be a useful guide.

Knowing how a Basic program is stored is vital if you want to go around doing clever things inside. Chapter 2 continues with a description of the format used for storing Basic programs, complete with a list (incomplete) of Basic keyboard codes — in other words, a table showing the relationship between the contents of the bytes which make up a Basic program and the character, or

word, that this represents.

It's also important to know how variables are stored, and this too is covered; but yet again there are errors which would cause problems if used in programs.

Inside the kernel

The Basic and Kernal ROMs are dissected with descriptions of all of the major routines. There is often insufficient information included to allow these routines to be used from within machine code programs, but they are a useful starting point for experimentation.

But once again the errors get in the way. Some of the routine addresses quoted are wrong; and the list of device numbers shows device 2 as being the second cassette which (as the book rightly points out) is unused on the Vic. Device 2 is actually the RS232 port.

After a quick look at what happens on switching on, with a description of how the Vic detects that a cartridge is present, there's a brief section on how to hook your own routines into the operating system. The description is very brief, and as a result is so totally inadequate as to be of little practical use.

The '6561 Interface Chip' is how chapter 3 refers to the Vic chip itself, and here we are given a guided tour of the registers in this chip — complete with some very simple programs to demonstrate how the screen can be moved around, and how colours can be changed.

The section on display modes, character generation and high resolution graphics varies from the sublime to the ridiculous. There are two good Basic program listings which allow graphs, points, lines and circles to be drawn in high resolution. But like the rest of the book they both assume that you've got no more than 3K of RAM expansion. If have more than this, the screen moves around in memory; and these programs don't take this into account.

The rest of the video section in this chapter is a bit of a mess. The description of setting up addresses in the Vic chip is poorly described, not to say wrong. And with programs containing such lines as:

**IF A = "*" THEN 30
POKE 6144 = 1,A**

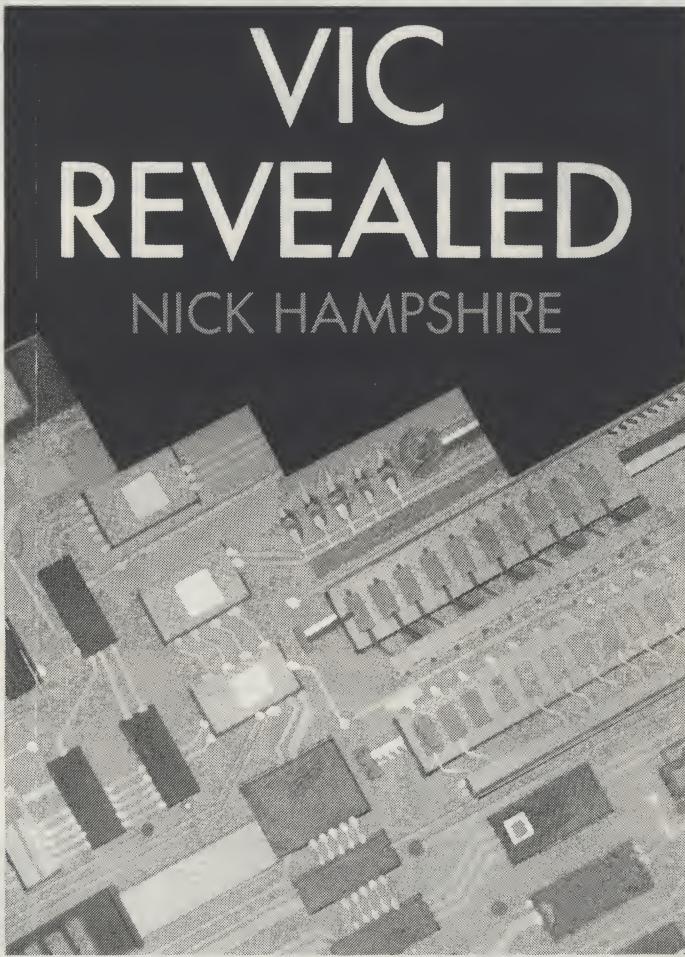
...there is little convincing evidence that the book was ever proofread.

Multi-colour mode and sound generation are both described fairly well. Some program examples for generating sound are given — most of them being straight from the handbook supplied with the Vic!

Attachments

Of course, the Vic chip is not the only interface chip; there are also the two 6522s, dubbed Versatile Interface Adapters (VIAs) by the manufacturer. These are used by the Vic to access the keyboard, cassette, user port (which doubles as the RS232 port) and the joystick inputs.

Chapter 4 describes these two chips as well as looking at the



various connectors that can be attached to the Vic.

Apart from the provisos that the information given is available (more accurately) in other sources, and that there are as many errors in this chapter as there are elsewhere, this section does provide a useful (if not very practical) guide to the VIs on the Vic.

The input and output capabilities of the Vic are often underrated, and chapter 5 looks at the major I/O functions available. The first part describes the operation of the cassette unit. This is literally a 'how it works' description with no coverage of how to use the cassette for storing data. There is a description of the Vic keyboard and how it is scanned together with a very simple program for testing the function keys within a Basic program.

RS232 operation is described fairly well, complete with a warning that OPEN used with the RS232 channel will cause a

CLR to be executed. (But there's no warning that a CLOSE will also perform a CLR...)

The section on joysticks is just about ok, but the program given to test joysticks is useless and makes no sense whatsoever. Anyone attempting to use it would soon become very frustrated. (The reason for such a useless program is that, like so many publications, the listings are not reproduced straight from a printout of a working program: instead they are typed by a typesetter with no checking afterwards.)

This chapter closes with a description of the memory expansion connector (the socket that cartridges fit into) and a look at the serial port used for disk and printer.

The Appendices contain a circuit diagram of the Vic (the American version, but the differences are slight), a description of some of the commands available using the Commodore VicMon machine-code

monitor cartridge, tables for hex-decimal conversion and 6502 opcodes, an assembly listing of a 'wedge' program intended for use at the start of a ROM pack (which could have been very useful if accompanied by some sort of commentary), and a table of CBM codes.

This last one gives a list of all codes from 0 to 255 and includes hex/decimal equivalents, ASCII and screen character codes, Basic token codes and even 6502 opcodes.

But it's a direct copy of one produced for the book's predecessor, Pet Revealed; so it contains none of the special Vic codes (such as colour control characters) — and some common codes are actually missing!

Last words

To my mind, this book is 266 pages of vaguely useful background for anyone who has already done some machine

code programming and wants to know a little more about what goes on under the lid of the Vic.

It is not a beginner's book. Nor does it make any attempt to teach the reader any of the concepts used. And anyone who does use it will need to be aware of the huge number of errors which still exist in the book.

In short, it has been put together with little or no awareness of what Vic users will need to know: and at times it even shows an ignorance of what is actually going on in the Vic. My own feeling? Save your pennies and buy the Programmers Reference Guide from Commodore or Prentice Hall — it's about the same price, more accurate, better presented and with significantly more in it!

Vic Revealed by Nick Hampshire (ISBN 0 7156 1699 4) is published by Duckworth at £9.95.

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DAMS' products reviewed

by Ken Ryder

Liverpool-based DAMS Office Products has a number of products that extend the basic Vic. Ken Ryder collected them and put the lot through their paces in the first of several round-up reviews that we are planning for individual suppliers.

RAM 'N' ROM Board

The standard Vic-20 is equipped with a fairly basic version of the Basic language: it does not contain commands for graphics colour or sound, nor does it have an 'on-board' machine-code monitor or a 'programmer's aid' utility. Several manufacturers now offer various ROM chips to make up for those deficiencies — including DAMS.

The VIC does not provide spare RAM or ROM sockets inside for those extra chips, so an expansion board is needed. DAMS has one. And DAMS has combined extra RAM and ROM sockets in one cartridge; and it can also supply a 'programmer's aid' chip with a machine code monitor.

The RAM 'n' ROM Board comes in a robust brown plastic cartridge and has 3K of RAM and two ROM sockets (located at \$A000 and \$6000 mounted on a circuit board. The two parts of the cartridge simply press fit together.

It plugs directly into the expansion slot at the back of the Vic, or into a suitable motherboard. As the cartridge is about two inches narrower than the expansion slot, you have to be careful when inserting it — unlike Commodore's own cartridges, which are self-aligning.

Although DAMS would obviously like everyone to use

its ROM chips in the sockets provided, any suitable add-in chip may be used. The 3K of extra RAM you get is available for Basic programs, or for high-resolution graphics if a graphics ROM is used.

VICAID

VICAID is a 4K plug-in ROM chip which gives the Vic several new features to help the programmer write Basic and small machine-code programs.

Those features include **AUTO**. One of the most tedious operations when writing a Basic program is the entry of each new line number; the **AUTO** command automatically generates line numbers (starting at line 100, and spaced on an increment specified by the programmer).

Have you ever wanted to insert a new line in a program only to find that there are no lines left? Well, the **RENUMBER** command enables you to renumber program lines including the **GOTO**, and **GOSUB** references to give new

line spaces; it is also useful for tidying up a fully-developed program.

The **DELETE** command allows the deletion of individual program lines or whole blocks of lines. The **FIND** command locates and displays the lines in which all specified Basic statement or string of text occurs: the string or statement can then be replaced with another string or statement using the **CHANGE** command.

All those commands aid the creation and editing of programs, but there are several more which help to debug the program when run. When a normal Vic error message appears during the execution of a program, VICAID's **HELP** command locates the appropriate line number and highlights the offending statement in reversed characters.

TRACE executes a program at reduced speed while displaying current line and previous four line numbers in the top right-hand corner of the screen. **STEP** is similar to **TRACE**, but the program executed line by

line as the shift key is pressed. **STEP** and **TRACE** are useful for checking the route taken through a program, and for finding never-ending **FOR-NEXT** or **IF-THEN** loops; the **OFF** command turns off **STEP** and **TRACE**.

The **KILL** command switches off the VICAID altogether; this is necessary because the VICAID is wedged in the Vic's system and can slow down the normal running of programs.

In addition to the normal programmer's aids, the VICAID contains two commands which can be used to read the ASCII code of a character on the screen (**LIGHTREAD**) or plot a character on the screen (**LIGHTPLOT**) via the DAMS lightpen or a similar product. These commands are only available in immediate mode, but **SYS** calls may be used to include them in Basic programs.

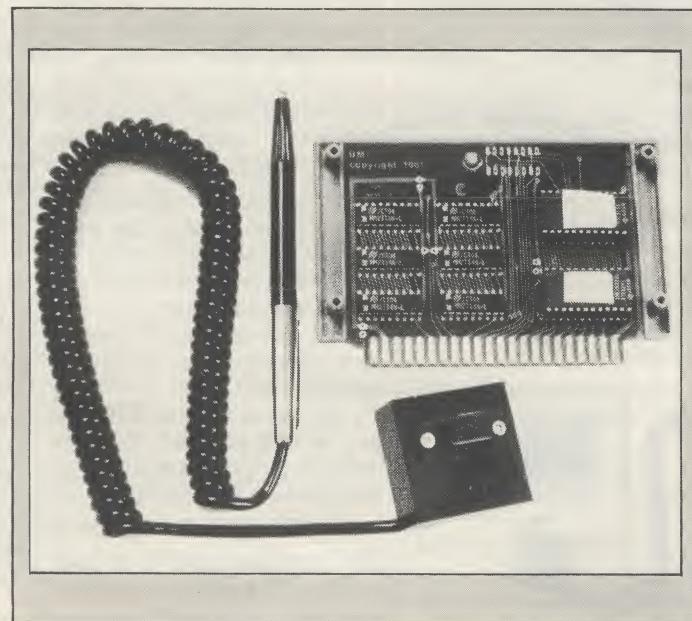
The **BREAK** command takes the Vic out of Basic into **TIM**, a built-in mini-machine code monitor. Basically **TIM** is a cut-down version of the **VICMON** monitor as described in the piece on that chip: you get nine of the commands.

VICMON

What do you need a machine code monitor for? Well if you have ever tried to reproduce Galaxians, Missile Command or Star Raiders using Basic, you'll know. For some purposes Basic is just too slow, producing flickering animation and sluggish response to controls. To overcome these problems the program must be totally or partially written in machine code.

Writing in machine code directly — in binary — is extremely difficult and should be avoided. The next step up is to write in 6502 mnemonics and hexadecimal notation, and this is where **VICMON** comes in. It takes the mnemonics and hex and converts them into machine code for you.

The commands include in **VICMON** to aid the writing and debugging of machine code programs are:



Under Review

A assembles 6502 mnemonics into opcodes and displays them on the screen. The mnemonics can be screen-edited if required.

D disassembles an area of memory into mnemonics, and displays the corresponding opcode. Again, the opcodes can be edited if necessary.

F fills an area of memory between two locations with a hex value from \$00 to \$FF (0 to 255 decimal). This is useful for initialising an area of memory before entering a program, or for filling the screen memory area with a specific character.

G executes a machine code program from a specified memory address.

H hunts through a specified area of memory for a series of hex values or ASCII characters enclosed in quotes, and displays the address of each occurrence of that series. (It is similar to the FIND command in VICAID.)

I displays the hex values of characters and their ASCII equivalent in an area of memory. This is useful for finding areas of text.

S saves an area of memory to tape or disk and gives it a name. (It's necessary because the normal Vic SAVE command can only save Basic programs.)

V verifies that the save area of memory on tape or disk is the same as that in the Vic.

L loads a previously-saved area of memory back into the Vic.

M displays a specified area of memory on the screen which can then be edited. This is useful for filling an area of memory with data for use by the main machine-code program.

N relocates a machine-code program from one area of memory to another and

alters the jump and branch addresses accordingly, unless the area of memory has been specified as a word table.

T transfers an area of memory from one location to another but does not attempt to alter the jump and branch addresses.

P is the same as the D command but the disassembled code is output to the printer, rather than the screen.

W walks or single-steps through a program (and is similar to the STEP command in VICAID).

B sets a breakpoint in the program: there it will stop and display the contents of the internal registers and enter W mode.

U unsets a breakpoint.

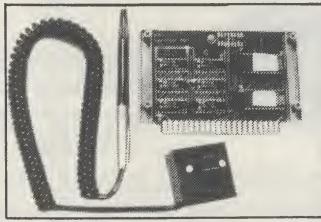
Q quick trace — runs all or part of a program at normal machine code speed until it encounters a breakpoint, when it will enter W mode.

R displays the contents of the 6502 internal registers — the program counter, the status register, accumulator, index registers X and Y, and the stack pointer. Each one can then be edited if desired.

@ displays the hex address of the start of the interrupt routine which is called every 1/60th of a second to service the keyboard etc. You can replace this routine with your own by overwriting the address.

X exits from VICMON back into the Vic's Basic.

? displays a list of the commands available on VICMON.



Light Pen

The DAMS light pen is a standard Platignum pen body with a light-sensitive element at the tip. It connects to the Vic games port via a neat black coiled cable: the nine-pin 'D' plug (and presumably some additional circuiting) is embedded in a cube of potting compound.

The pen uses two registers, 36870 and 36871, to record its horizontal and vertical positions respectively.

The highest resolution available on the Vic is 184 rows by 176 columns of individual pixels. As the pen is moved vertically down from the top of the screen area to the bottom the contents of register 36870 vary from 38 to 129; so one number represents approximately two vertical pixels. If the pen is moved horizontally from left to right the contents of 36871 vary from 45 to 137 in increments of two — and one number therefore represents about four horizontal pixels.

All this means is that the minimum resolution of the light pen is an area of eight pixels ie one eighth of a character.

As with all games port accessories, like joystick and paddles, the light pen requires some software to make it do something. The documentation provided with the pen consists of two pages of Xeroxed A4 sheets stapled at one corner and containing one example program. The program isn't very useful; and the rest of the instructions don't describe how to write any others. Nor do they suggest any possible applications for the pen.

Using the pen should simply be a matter of placing the point against the screen, reading the contents of registers 36870 and 36871 and converting them into screen co-ordinates. The pen is very sensitive to brilliance, however, and I had to turn my TV set above normal to get the pen to operate. But, then the pen was picking up readings an inch or so away from the screen — causing unexpected results.

This problem could have been avoided if a switch had been included in the pen to activate

it only when in contact with the screen (a feature which is included in Stack's lightpen, for one).

It can be overcome by including a 'switch' in the software controlling the pen; but this is not even hinted at in the documentation.

Good uses for the pen would include moving objects around the screen in board games or graphics applications, and selecting options from a menu screen by pointing at them with the pen. Would that DAMS had provided a bit more information on those.

Conclusions

At £22.94 each VICAID and VICMON probably represent reasonable value for money, at least when compared with similar products on the market, some of the VICMON commands are duplicated on the VICAID — which seems a waste.

the combination of RAM and extra ROM in one cartridge definitely increases the versatility of the Vic; and £26.39 again seems a reasonable price to pay. Once the cartridge has been plugged into the Vic, however, a motherboard is required for any further expansion. (A similar product from Stack avoids this limitation by reproducing the expansion slot at the back of its own RAM/ROM board.)

The Lightpen has the limitations described. In fact the first unit received for review didn't work at all, and the second developed faults after a few hours' operation. The pen's workings are completely sealed so there was no chance of home repairs. The nibs of both units were loose, and the cable in the second unit was not securely anchored. For £22.94, I would expect better quality and performance than this.

The documentation supplied with all the products is poorly presented on A4 sheets which are not very useful. Considering that many prospective customers are very few example programs. Overall the approach is unprofessional.

Conclusion? Could do better.

Victuals

How to type in Victuals and Routines

Up to now we've been taking listings for Vic and 64 programs and routines direct from the 1515 printer — in other words, they come out exactly as they were originally programmed (though usually we renumber lines and add an introductory attribution).

But this obviously means that the screen control codes, which appear in listings as symbols, have been printed as they stand... and this can cause you more than a few problems. You often have to look up the symbol in the Vic user handbook to find out what it means. And the 1515 isn't exactly the world's most precise printer; it sometimes difficult to decipher exactly what the symbol in question is.

So for this issue we're trying an experiment — all Victuals have been run through a conversion program that substitutes for the screen control codes a more intelligible set of commands. These you'll find in square brackets.

When you see...	It means...	You type...
[HOM]	Cursor home	HOME
[CLR]	Clear screen	CLR (shift + HOME)
[INS]	Insert	INST (shift + DEL)
[CUP]	Cursor up ↑	
[CUD]	Cursor down ↓	
[CUL]	Cursor left ←	
[CUR]	Cursor right →	
[BLK]	Switch to black	CTRL + 1
[WHT]	Switch to white	CTRL + 2
[RED]	Switch to red	CTRL + 3
[CYN]	Switch to cyan	CTRL + 4
[PUR]	Switch to purple	CTRL + 5
[GRN]	Switch to green	CTRL + 6
[BLU]	Switch to blue	CTRL + 7
[TEL]	Switch to yellow	CTRL + 8
[RVS]	Reverse on	CTRL + 9
[RVO]	Reverse on	CTRL + 0
[F1]	Function key 1	f1
[F2]	Function key 2	f2
[F3]	Function key 3	f3
[F4]	Function key 4	f4
[F5]	Function key 5	f5
[F6]	Function key 6	f6
[F7]	Function key 7	f7
[F8]	Function key 8	f8

```

10 REM ****
*SUPERGRAPH BY:*
*RISTO LANKINEN*
*****
20 000 Y=16/(XXX-8)
30 POKE56,26:POKE52,26:POKE648,26:PRINT "[CLR][RVS][YEL]>>> SUPERGRAPH <<<" :P
0KE36869,239
40 POKE657,128:POKE36879,40:FORR=7168T08191:POKER,0:NEXT:FORR=6898T06919:POKER,2
28:NEXT
50 FORR=6689T07151STEP22:POKER,229:NEXT:POKE6909,204
60 REMFORR=6678T07161:POKER,230:NEXT
70 FORCO=0T021:FORBI=0T07:X=C0-11+BI/8+.01:Y=0
80 :
90 REM-----
100 Y=16/(XXX-8)
110 REM-----
120 :
130 Y=1.7*Y:R0=INT(12-Y):BY=INT(8*(Y-INT(Y))):IFR0<10RR0>22THEN220
140 LO=6656+C0+22*R0:IFPEEK(LO)=CHTHEN200
150 IFNOT(PEEK(LO)=32)ORPEEK(LO)>127)THEN200
160 CH=CH+1:IFCH=32THENCH=CH+1
170 IFCH>127THEN220
180 POKE6656+C0+22*R0,CH
190 IFCO=11THENFORR=0T07:POKE7168+8*CH+R,PEEK(7168+8*CH+R)OR128:NEXT
200 LO=7175+8*PEEK(LO)-BY:POKELO,PEEK(LO)OR(21*7-BI))
210 IFR0=11THENPOKE7175+8*PEEK(6656+C0+22*R0),255
220 NEXT:NEXT:WAIT203,63,64:POKE198,0
230 REM----- ADJUST LINE 50 FOR ANY OTHER FUNCTION -----

```

Supergraph

by Risto Lankinen

More international input — from Risto Lankinen, featuring hi-res graph-drawing without the Super Expander.

It draws a graph for almost any function — change line 100, which at the moment for the purpose of demonstration calculates $Y = 16/(X^2 - 8)$, to whatever you want. The X axis ranges from -10 to +10, Y is -6 to +6.

One clever part is the size of the screen: you get 176x176 dots, which is a better resolution than the Super Expander provides.

Victuals

Morse Trainer

A strong international flavour to Victuals this time — Clarence comes from Belleville, Illinois.

This program is designed to help teach the morse code to Boy Scouts and others: it is particularly useful when there is no experienced trainer available as the timing of the dots & dashes is precise. After you enter the desired speed (and you hit RETURN) Vic beeps out the signal and prints the symbol and its code invisibly each time a letter or numeral key is pressed. After sending a word, you or the trainer can make it visible by pressing F1. This proves what you sent — something which is difficult to do when working with a key.

I was unable to restrict the action to the alpha and numeric keys. This produced an unexpected benefit in that hitting the space bar repeats the signal last sent.

The program will operate on the unexpanded Vic but runs out of memory after 23 characters have been sent: expansion makes no difference, but this is no great problem as the boys who use it like to go with one word at a time. One must remember to re-run after two screens-full of words, however I used a different pitch for dots and dashes: change lines 630 and 650 to **POKE 36875,225** to get the same pitch for both

```

10 REM*****
20 REM MORSE TUTOR
30 REM BY CLARENCE BUCKLEY
40 REM*****
50 POKE36879,27
60 PRINT "[CLR][BLK]WHAT SPEED DO YOU WANT?"
70 INPUT "F:M:S";R$
80 IF R$="F" THEN R=100
90 IF R$="M" THEN R=300
100 IF R$="S" THEN R=500
110 PRINT "LETTER & MORSE SYMBOL WILL BE INVISIBLE"
120 PRINT "F1 MAKES VISIBLE"
130 PRINT "F3 MAKES INVISIBLE"
140 PRINT "F5 RERUNS PROGRAM"
150 GET M$: IF M$="" THEN 150
160 IF M$="A" THEN A=1:B=2:C=3:D=3:E=3:F=4
170 IF M$="B" THEN A=2:B=1:C=1:D=1:E=3:F=4
180 IF M$="C" THEN A=2:B=1:C=2:D=1:E=3:F=4
190 IF M$="D" THEN A=2:B=1:C=1:D=3:E=3:F=4
200 IF M$="E" THEN A=1:B=3:C=3:D=3:E=3:F=4
210 IF M$="F" THEN A=1:B=1:C=2:D=1:E=3:F=4
220 IF M$="G" THEN A=2:B=2:C=1:D=3:E=3:F=4
230 IF M$="H" THEN A=1:B=1:C=1:D=1:E=3:F=4
240 IF M$="I" THEN A=1:B=1:C=3:D=3:E=3:F=4
250 IF M$="J" THEN A=1:B=2:C=2:D=2:E=3:F=4
260 IF M$="K" THEN A=2:B=1:C=2:D=3:E=3:F=4
270 IF M$="L" THEN A=1:B=2:C=1:D=1:E=3:F=4
280 IF M$="M" THEN A=2:B=2:C=3:D=3:E=3:F=4
290 IF M$="N" THEN A=2:B=1:C=3:D=3:E=3:F=4
300 IF M$="O" THEN A=2:B=2:C=2:D=3:E=3:F=4
310 IF M$="P" THEN A=1:B=2:C=2:D=1:E=3:F=4
320 IF M$="Q" THEN A=2:B=2:C=1:D=2:E=3:F=4
330 IF M$="R" THEN A=1:B=2:C=1:D=3:E=3:F=4
340 IF M$="S" THEN A=1:B=1:C=1:D=3:E=3:F=4
350 IF M$="T" THEN A=2:B=3:C=3:D=3:E=3:F=4
360 IF M$="U" THEN A=1:B=1:C=2:D=3:E=3:F=4
370 IF M$="V" THEN A=1:B=1:C=1:D=2:E=3:F=4
380 IF M$="W" THEN A=1:B=2:C=2:D=3:E=3:F=4
390 IF M$="X" THEN A=2:B=1:C=1:D=2:E=3:F=4
400 IF M$="Y" THEN A=2:B=1:C=2:D=2:E=3:F=4
410 IF M$="Z" THEN A=2:B=2:C=1:D=1:E=3:F=4
420 IF M$="1" THEN A=1:B=2:C=2:D=2:E=2:F=4
430 IF M$="2" THEN A=1:B=1:C=2:D=2:E=2:F=4
440 IF M$="3" THEN A=1:B=1:C=1:D=2:E=2:F=4
450 IF M$="4" THEN A=1:B=1:C=1:D=1:E=2:F=4
460 IF M$="5" THEN A=1:B=1:C=1:D=1:E=1:F=4
470 IF M$="6" THEN A=2:B=1:C=1:D=1:E=1:F=4
480 IF M$="7" THEN A=2:B=2:C=1:D=1:E=1:F=4
490 IF M$="8" THEN A=2:B=2:C=2:D=1:E=1:F=4
500 IF M$="9" THEN A=2:B=2:C=2:D=2:E=1:F=4
510 IF M$="0" THEN A=2:B=2:C=2:D=2:E=2:F=4
520 IF M$=CHR$(133) THEN POKE36879,8:GOTO150
530 IF M$=CHR$(134) THEN POKE36879,27:GOTO150
540 IF M$=CHR$(135) THEN RUN
550 PRINT "[WHT] M$ = "
560 ON A GOSUB 620,670,720,730
570 ON B GOSUB 620,670,720,730
580 ON C GOSUB 620,670,720,730
590 ON D GOSUB 620,670,720,730
600 ON E GOSUB 620,670,720,730
610 ON F GOSUB 620,670,720,730
620 PRINT ".";
630 POKE36878,15:POKE36875,225
640 FOR T=1 TO R :NEXT
650 POKE36875,0:POKE36878,0
660 RETURN
670 PRINT "[RV1] [RV01]"
680 POKE36878,15:POKE36874,225
690 FOR T=1 TO R*3 :NEXT
700 POKE36874,0:POKE36878,0
710 RETURN
720 PRINT ".";
730 PRINT "[CUD1]":GOTO 150

```

by Clarence Buckley

Last month's blunders

Just as well we ran the 'publishers's guarantee' in the last Vic Computing. The culprit has been despatched to our Siberian office to check out the opportunities for Vic-driven saltcellar-filling; but there were two Super Expander programs in our last issue, and because they were listed without the cartridge installed there was a lot of incomprehensible garbage in the listings. This should set matters right:

```

10 COLOR1,3,0,0
70 POKE650,127:GRAPHIC2:COLOR1,5,0,0:GOSUB300
160 POINT2,X,Y
210 COLOR 1,2,0,0
240 GRAPHIC:COLOR1,3,0,1:POKE650,128:END
310 DRAW2,OF*K,ZX*KTOK*(160-OF),ZX*K:DRAW2,ZY*K,OF*KTOZY*K,K*(160-OF)
320 FOR I=OF*KTO155*KSTEP OF*K:POINT2,I,K*(ZX+2):POINT2,K*(ZY+2),I:NEXT:RETURN
420 COLOR1,5,0,0:RETURN

```

Turtle

Change Line 40 to read GRAPHIC 2 and Line 50 to read POINT.

Multigraph

Here's the revised listing, complete with control codes converted:

Fly Snatcher

(VIC-20)

Our Long Established Best Seller!

You are in a field with bushes, and only flies to live on. You must survive by snatching each fly and then diving into a bush or the edge of the field. However, a weasel also lives in the field and is determined to eat you, he will move in any direction and will even jump through bushes to reach you. Each session of fly snatching you survive leads to another with even more flies and a faster weasel.

- ★ ★ ★ ★ ★
Unexpanded VIC
Joystick or keyboard
Difficulty increases on each page
World Record 126 flies —
can you beat it?



Alien Hunter

(VIC-20)

Experience the safari of the future.

Hunt the alien moving around your sector at the speed of light. Destroy the alien's drones as he lays them in your path, whilst avoiding rogue asteroids. Watch out! Your fuel is diminishing and the pace is accelerating. Your chances of survival are slim.

- ★ High speed machine code action
 - ★ Unexpanded VIC
 - ★ Joystick control
 - ★ 10 levels of play
 - ★ High score display
 - ★ Fuel replenishment
 - ★ Fire action in any direction

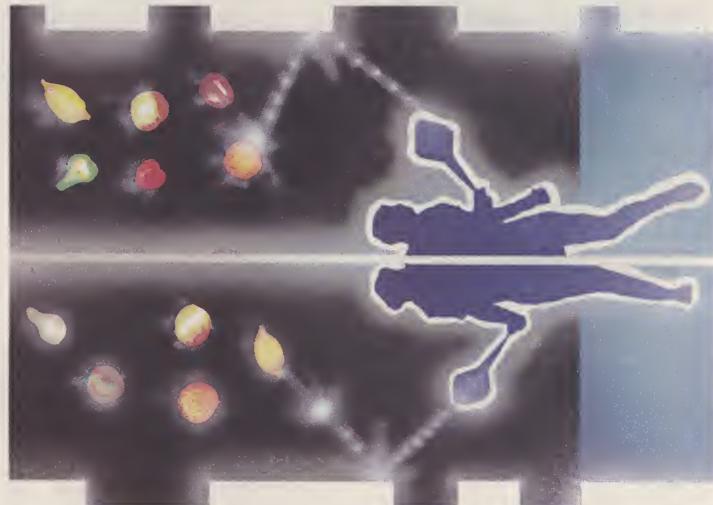


Double Trouble
(VTC 20)

This appealing game enables two players or one player versus VIC to enter a high speed world where reactions and judgement are paramount to survival. Players must deflect their ball into fruit-like objects that appear despite "Schizophrenic Spike" who roams the play area. The game would be simple but for the growing walls and court boundaries and . . .

- ★ Unexpanded VIC
 - ★ High speed machine code action
 - ★ 1 or 2 players
 - ★ Numerous options of play
 - ★ Score display
 - ★ Life display

!!! Be thankful this is only a game !!



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DOUBLE TROU
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for £.....
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Victualls

Jigsaw

by David Howe

A biggish but excellent game from Dr Howe — he calls it a jigsaw, but in fact it has more in common with those shape-matching games you see in IQ tests (and which the older among us might remember from things like the Eleven Plus).

As the author points out, it's more contemplative than the usual pow/zap/squelch war-mongering or galactic conquest of which we're getting so

weary: full marks for a different kind of game.

The instructions are written in Set 2 symbols (upper and lower case). That POKE 36869,242 in line 30 should be altered if you want the standard upper-case set; either drop it or POKE 36869,240. It's easy enough to type in however if you hit the CBM and shift keys to get into upper-and-lower-case mode while you're putting in the instruction lines

```

40 REM *****
50 DIMS(12,10):W=0
60 POKE36869,242:PRINT "[CLR]"
70 PRINTTAB(7);"[RED][RVS] \|-•@o[RVO][BLU]":PRINT:PRINT
80 PRINT"ASSEMBLE THE SHAPES"
90 PRINT"INTO A RECTANGLE":PRINT
100 PRINT"TO MOVE A PIECE, PRESS:"
110 PRINT"A.\nS LETTER"
120 PRINT"B.\nIRECTION: / P"
130 PRINTTAB(13);"- O\\N"
140 PRINTTAB(13);"L EFT"
150 PRINTTAB(13);"- IGH":PRINT
160 PRINT"RESS F1 FOR HELP":PRINT:PRINT:PRINT:PRINT
170 PRINT"RESS A KEY"
180 GETA$:IF A$=""THEN100
190 POKE36869,240:POKE36879,24:PRINT "[CLR][CUD]
[RVS]WAIT!![RVO][BLU]"
200 J=INT(1+12*RND(0))*10
210 FORA=1TOJ:READS:NEXTA
220 FORB=1TO12
230 FORA=1TO10
240 READS(B,A):IFS(B,A)=-1THENRESTORE:GOT0230
250 NEXTA
260 P=INT(18*RND(0))+44+22*INT(14*RND(0))
270 FORA=1TO10:S(B,A)=S(B,A)+P:NEXTA
280 FORA=1TO10
290 IFPEEK(7680+S(B,A))<>32THEN340
300 NEXTA
310 GOSUB750:GOSUB620
320 NEXTB
330 GOT0360
340 FORA=1TO10:S(B,A)=S(B,A)-P:NEXTA
350 GOT0260
360 T1=TI
370 POKE198,0
380 GOSUB860
390 PRINT "[HOM][CUD] PIECE(OR F1)? ":"GETP$:IF P$=""THEN390
400 IF P$!="F1"THENGOSUB770:GOT0390
410 IF P$<"A"OR P$>"L"THEN390
420 B=ASC(P$)-64
430 PRINT "[HOM][CUD] DIRECTION(U,D,L,R)? ":"GETD$:IF D$=""THEN430
440 IF D$<"U"AND D$>"D"AND D$<"L"AND D$>"R"AND D$>"F1"THEN430
450 IF D$!="F1"THENGOSUB770:GOT0390
460 IF D$="U"THEN D=-22:GOT0540
470 IF D$="D"THEN D=22:GOT0560
480 IF D$="R"THEN D=1:GOT0580
490 D=-1
500 FORA=5TO7
510 IFS(B,A)/22=INT(S(B,A)/22)THENGOSUB720:GOT0390
520 NEXTA
530 GOSUB1100:GOT0380
540 IFS(B,1)<>66THENGOSUB720:GOT0390
550 GOSUB1100:GOT0380

```

```

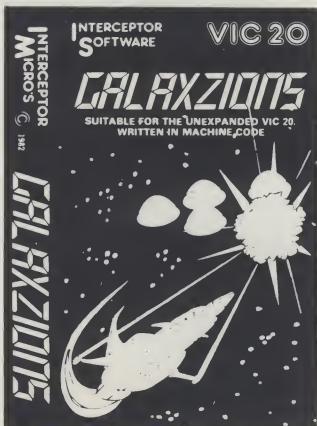
560 IFS(B,10)>483THENGOSUB720:GOT0390
570 GOSUB1100:GOT0380
580 FORA=4TO6
590 IF(S(B,A)+1)/22=INT((S(B,A)+1)/22)THENGOSUB720:GOT0390
600 NEXTA
610 GOSUB1100:GOT0380
620 FORA=1TO10
630 IF B>6THEN670
640 IF A=1THENPOKE7680+S(B,A),B+128:GOT0660
650 POKE7680+S(B,A),160
660 POKE38400+S(B,A),B+1:GOT0700
670 IF A=1THENPOKE7680+S(B,A),B+128:GOT0690
680 POKE7680+S(B,A),102
690 POKE38400+S(B,A),B-5
700 NEXTA
710 RETURN
720 W=W+10:POKE36874,200:POKE36878,15
730 FORT=1TO100:NEXTT
740 POKE36874,0:RETURN
750 POKE36876,220:POKE36878,15
760 POKE36876,0:RETURN
770 REM ANSWER
780 PRINT "[CLR]":PRINT:PRINT:PRINT
790 PRINTTAB(6);"\|_||_||"
800 PRINTTAB(6);"\|_||_||"
810 PRINTTAB(6);"\|_||_||"
820 PRINTTAB(6);"\|_||_||"
830 PRINTTAB(6);"\|_||_||"
840 PRINTTAB(6);"\|_||_||"
850 PRINTTAB(6);"\|_||_||"
860 PRINTTAB(6);"\|_||_||"
870 PRINTTAB(6);"\|_||_||"
880 PRINTTAB(6);"\|_||_||"
890 PRINTTAB(6);"\|_||_||"
900 PRINTTAB(6);"\|_||_||"
910 FORT=1TO1500:NEXTT
920 PRINT "[CLR]"
930 FORB=1TO12:GOSUB620:NEXTB
940 POKE198,0
950 W=W+300:RETURN
960 FORK=8185T07975STEP-1
970 IFPEEK(K)<>32THENK1=K:GOT0990
980 NEXTK
990 FORL=0TO11
1000 FORM=0TO9
1010 IFPEEK(K1-M-22*L)=32THENRETURN
1020 NEXTM,L
1030 T2=TI
1040 POKE36876,224:POKE36878,15
1050 FORT=1TO500:NEXTT
1060 POKE36876,0
1070 PRINT "[HOM][RED] WELL DONE"
1080 PRINT "[BLU]SCORE:":INT(1000000/((T2-T1)/60+W)):[CUL]
1090 GOT01890
1100 FORA=1TO10:POKE7680+S(B,A),32:NEXTA
1110 FORA=1TO10
1120 IFPEEK(7680+S(B,A)+D)<>32THENGOSUB720:GOSUB620:RETURN
1130 NEXTA
1140 GOSUB750
1150 FORA=1TO10:S(B,A)=S(B,A)+D:NEXTA
1160 GOSUB620:RETURN
1170 DATA0,1,22,23,45,67,88,89,110,111
1180 DATA1,23,45,67,88,89,110,111,132,154
1190 DATA0,1,2,3,22,23,24,25,47,69
1200 DATA1,23,45,46,67,88,89,110,111
1210 DATA1,2,23,24,44,45,66,67,88,110
1220 DATA0,22,44,45,46,66,67,88,89,110
1230 DATA1,2,23,24,45,67,88,89,110,111
1240 DATA0,1,2,3,4,22,23,24,25,26
1250 DATA1,23,44,45,46,66,67,88,89,111
1260 DATA0,1,2,22,23,24,44,45,66,88,110
1270 DATA0,1,22,23,44,45,66,67,89,111
1280 DATA1,23,44,45,46,47,66,67,88,69,-1

```

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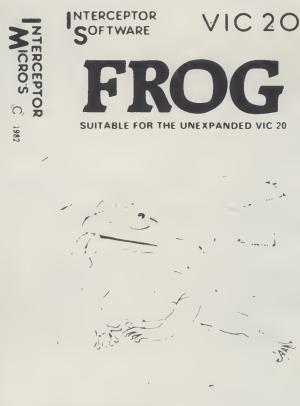
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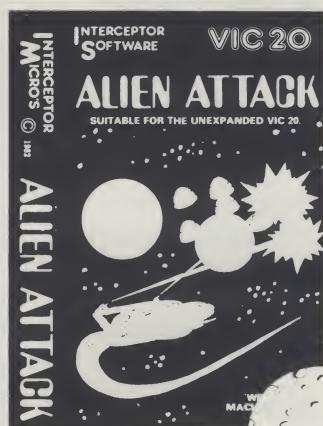
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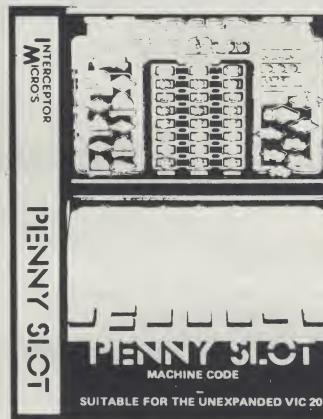
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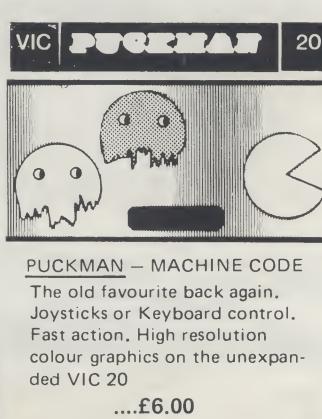
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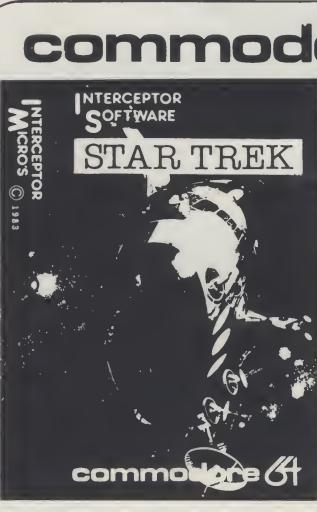
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Victuals

Movies

by M Valentine

"The program lets you be your own movie director" promised the letter accompanying this Victuals submission. Well, it's not quite that grand: but it does provide a clever and neat way of storing screen images direct to tape.

You can set up quite complex 'scenes' and watch them play back at your command. There's no limit to the length of your 'movie', since each character is written to the cassette as soon as you put it on to the screen — that makes for some pauses, but don't worry!

Converting this to disk would speed up the movie-making, but you'd have to put in a delay loop for the playback — otherwise it would go through too quickly.

```

10 PRINT "[CLR][BLK][RVS]*****  
*****": S=36879  

20 PRINT "[CUD][CUD]BY M. VALENTINE 1983": POKE 142  

30 PRINT "[CUD][CUD][RVS]R[RVO]EAD/[RVS]W[RVO]RITE/[RVS]Q[RVO]UIT ?": POKE 198,0  

40 GETA$: IF A$="R" THEN 100  

45 IF A$="Q" THEN PRINT "[CLR]PROGRAM TERMINATED.": END  

50 IF A$<>"W" THEN 40  

60 PRINT "[CLR]NAME OF MOVIE -": INPUT NM$  

70 PRINT "[CUD]INSERT TAPE IN DATASSETTE AND PRESS RETURN": POKE 198,0  

80 GETA$: IF A$<>CHR$(13) THEN 80  

90 PRINT "[CUD][CUD]PRESS F7 WHEN MOVIE ISCOMPLETE."  

100 OPEN1, 1, 1, NM$  

110 PRINT "[CLR]:[CUL]";  

120 GETC$: IF C$=="THEN 120  

140 IF C$=CHR$(148) OR C$=CHR$(20) OR C$=CHR$(13) THEN 120  

150 IF C$="THENC$=[CUR]"  

160 PRINT "[CUL]"; C$; "[CUL]";  

170 IF C$=CHR$(44) THENC$=[F2]"  

180 PRINT #1, C$  

190 IF C$="F7" THEN CLOSE1: RUN  

200 GOTO 120  

1000 PRINT "[CLR]NAME OF MOVIE -": INPUT NM$  

1010 PRINT "[CUD]INSERT TAPE IN DATASSETTE AND PRESS RETURN": POKE 198,0  

1020 GETA$: IF A$<>CHR$(13) THEN 1020  

1030 OPEN1, 1, 0, NM$  

1040 PRINT "[CLR] [CUL]";  

1050 INPUT #1, C$  

1055 IF C$="F7" THEN CLOSE1: FOR G=1 TO 3000: NEXT: RUN  

1060 IF C$="F2" THENC$=CHR$(44)  

1070 PRINT "[CUL]"; C$; GOTO 1050

```



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Upside down

by Josh Rai

A US contribution again — Josh is 10 and comes from Great Neck, New York (yes, those places really do exist).

This is a neat little piece probably completely useless but quite fun. The program just switches between a word and its upsidedown mirror image. Only letters will work, by the way.

```

10 REM ****  

20 REM UPSIDE DOWN  

30 REM BY JOSH RAI  

40 REM ****  

50 A=7175  

60 R=0  

70 FORT=ATOA-7STEP-1: R=R+1  

80 X(R)=PEEK(T+25600)  

90 NEXT  

100 R=0  

110 FORT=A-7TOA: R=R+1: POKE T, X(R): NEXT  

120 IF A<7672 THEN A=A+8: GOTO 100  

130 PRINT "[CLR]";  

140 PRINT "[HOM][CUD][CUD]UPSIDE DOWN LETTERS!!!"  

150 PRINT "[HOM]";  

160 POKE 36869, 255: FORT=1TO150  

170 GOSUB 220: NEXT  

180 POKE 36869, 240  

190 FORT=1TO150  

200 GOSUB 220: NEXT  

210 GOTO 160  

220 GETA$: IF A$==" THEN 240

```



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Dear Vic

Dear Vic,

I spoke to you on the telephone on Thursday 28th April and you said to write a few lines, so here they are.

I am very angry and upset at the number of so-called "games writers" who never have an original idea in their lives. They merely learn how to program in Basic, and then look around to see what they can rip-off. If the current arcade favourite is beyond their capabilities to duplicate, they buy the computer magazines and "adapt" (steal) the programs therin to their own computers.

A good example of this is a game which you called DAM which was published in your April issue. The "author" was supposedly a D. WILLIAM. In fact the game was originally called "NIBBLERS" and was written originally for the PET. I spent several weeks thinking of the idea of the game, the idea being the main thing. Then a couple of days to program it. It was originally published in



"COMPUTER & VIDEO GAMES" magazine about 18 months ago. It was republished in a VIC20 version this year; it was also ripped-off in another magazine "YOUR COMPUTER" last summer. I didn't get a lot for the original game, but the pleasure of seeing my name in print was nice.

These thieves get the same, or in some cases more than I did for stealing my idea. I have decided never to bother sending any of my best games to mags again.

Remember — just because you can program in Basic, it does not make you a games writer.

Paul Jay, 49 Cahir Street, London E14

We've had occasion to fulminate against people ripping off programs before. The fact that the lawyers haven't yet figured out a sensible way to protect copyright on software is hardly an excuse: if you take someone's published game and modify it only slightly, it does not and cannot morally become your property. By allowing a game to be printed, a program's author is in effect doing you a favour: it's unworthy to abuse the trust and openness that this implies.

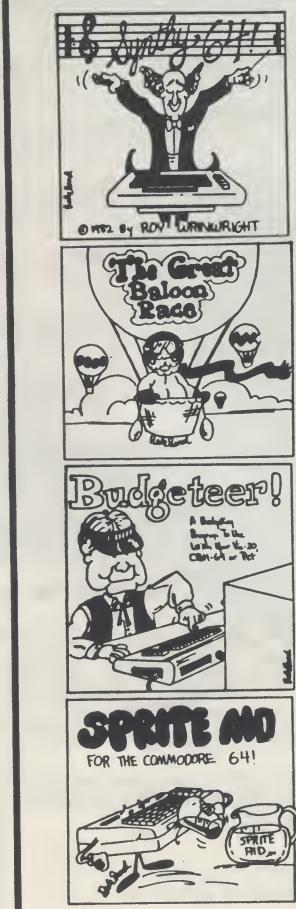
Dear Vic,

Like Alexander Colombo, I too have found the Super Expander bug of not being able to print sound with hi-res graphics: but I have found that it isn't necessary to revert back to pokes. Simply print sound at the top of the screen. Here is Alexander Colombo's program amended (Feb 83):

```
90 GRAPHIC 2:X = 200
95 CIRCLE 2,100,560,35,50
97 PRINT "<HOME>
    <CTRL-->V9S203T1
    GGCD"
100 REGION 2 : DRAW2, X,
    560T020,560
110 REGION 1 : Y = Y +
    20:DRAW 1,
    X-20;560TOX,560:1F
    X> = 1024 THEN
    X = 200:GOTO 97
120 GOTO 100
```

This time the program works perfectly, without pokes.

Ian George, Hayes, London



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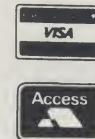
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Dear Vic

Dear Vic,

We have not been able to ascertain whether the Vic computer and its accessories is suitable for running a small business. The salesman at the shop where we bought it said that it would, with the addition of the right software.

The business I am referring to is that of a small firm which will require stock-list, price list, addresses of customers and suppliers, invoices, statements and letters (circular or reminders), with relevant calculations of discounts and VAT.

Apart from the Vic 20 itself, we have also purchased one 8K RAM cartridge, the CZN cassette and tapes. We know that eventually we will require a printer. But before we come to this, are you able to assure us that a small business as described can be run on it, and with which program?

If this is possible, please let us know how to write a program, or how to get a program to do the job; otherwise we probably have to give up the whole idea and perhaps return the set to the dealer.

P&A Consoli, 52 Eastern Road, London N2

Dear Vic,

Here is a collection of errors in the Vic-20 Programmer's Reference Guide which I have come across:

1. **Page 89:** the four-line program at the page foot should read:

10 POKE 36879,8: PRINT CHR\$

(147)

20 FOR I = 0TO7: FOR

M = 0TO7: FOR L = 0TO7

30 POKE 7680 + M*22 + L,

L*8 + M

40 NEXT: NEXT: NEXT

2. **Page 90:** the fourth line down read as:

05 POKE 36869,255

3 **Page 239:** in the Screen Dump, line 60010 should read:

60010 RS = CHR\$(145): V\$ =

```

500 REM *****SCREEN DUMP *****
510 OPEN4,4:PRINT#4,CHR$(145):Z=145
515 PRINT#4,CHR$(13):GOT0628
520 REM *****SCREEN DUMP *****
525 OPEN4,4:PRINT#4,CHR$(13):Z=17
530 PRINT#4,CHR$(17)
535 FORP=1TO56
540 C=0
545 C=PEEK(P+7679):E=C
550 IF ((P+7679)/40)=INT((P+7679)/40)THEN PRINT#4,CHR$(13)
555 C$=""
560 IFC>32ORC>95ANDC>128THENC=C+64
565 IFC>31ORC>64THENC=C
570 IFC>63ORC>96THENC=C+32
575 C=C-32
580 C$=C$+CHR$(C)
585 IFE=42THEN700
590 PRINT#4,CHR$(14)CHR$(2)C$:NEXT
595 CLOSE4:END

```

UPPER CASE

LOWER CASE

On the feasibility of using a Vic for business functions, you will indeed need some extra software and a printer; for stock control I suggest you contact some of our advertisers — L&J computers, who also have an program for addresses and mailshots: Computer Room also has a good addressing program. For your sales and invoicing, I would suggest three possible suppliers — John Probert: Specific Software: and SIP (see reviews in this issue).

It is perfectly possible to run a small business on a Vic system. But you must accept the limitations implicit in the use of a small and low-cost computer. You will be limited in the amount of information that you can hold; so your business may be simply too large for the computer. The programs that run on the Vic are necessarily more limited than those available for a larger computer: so you may find that certain things essential to your needs are not included. And you should be aware that using a cassette will be slow and limited; you should certainly consider purchasing a 1540 disk drive.

Dear Vic,

Guided by an advertisement in your magazine I ordered some equipment from the Dutch firm Computer World, using my Access card for payment. For this, I was charged some £16 more than the advertised price; and upon my anguished complaint, I was informed by Computer World that this unhappiness was caused by the fall of the value of the pound against the florin. My purchase was made in early December 1982, before any significant movement in the £, so goodness knows what will be required now. However, I note from the February magazine that their advertised prices remain the same. You will, I am sure, feel some small responsibility for all that appears in your journal and may wish to warn readers of what could appear as a rather keen-edged practice...

It is announced that in later issues, the VIC-20 is to share material space with the Commodore 64. Presumably, this is at Commodore's insistence. Perhaps a more vigorous argument could be made that a split interest is to neither computer owner's advantage and magazine and product loyalty should be seen to work both ways. Is the magazine's name to be changed, too?

You will know that your magazine goes from strength to strength, both you and your staff. The above is offered as a small curb to any hint of smugness, together with a reader's congratulations.

C B Spencer, 81 London Road, Twyford, Reading

We have been accumulating a file of complaints about the business practices of the Dutch firm Computerworld, and I recently passed them all over to our lawyer for an opinion. His initial verdict is that they probably aren't breaking the law; he's still working on it, but a Dutch firm isn't bound by the British Sale of Goods Act and there is (as yet) no equivalent ECC legislation.

As for the boo-hoo on potentiometer joysticks, mea maxima culpa: the piece appears in this issue.

The inclusion of the 64 is not at Commodore's insistence — the pressure has been coming from readers. The similarity between the two machines, the degree of compatibility that exists and the use of an identical Basic does suggest that some material should be common — and that 64 articles would indeed be of interest to a number of readers.

Dear Vic,

In your February 1983 issue someone claimed there's a bug in the Super Expander cartridge. This is not so — it appears because in his line 97 he prints up "PV9 . ." when it should be "QV9". This aborts printing to the screen and so stops the hi-res display drifting in a northwest direction because the hi-res screen is made up of custom characters and when you print things to the screen it will scroll up.

Adrian Aitken, 35 Millais Park, Mont Millais, Jersey.

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- **3 SLOT MOTHERBOARD:** This is a simple box plugging straight into the VIC 20, providing support for various cartridges. It comes with a switch to isolate the **Super Expander Cartridge** from **Commodore**, a switch to simulate **games cartridges**, a battery back up connector* and there is also room for **8K of extra Ram** if required*.
- **A SPECIAL RAM CARTRIDGE:** This can be used instead of the **Commodore cartridge**, and offers 16K of extra RAM. A further 16K can also be added, giving 28159 bytes free for Basic and 8192 bytes free for machine code.
- **A SPECIAL EPROM CARTRIDGE:** This is designed to offer **access speed** of disk, security of **ROM** and **ease of use** with tapes. Basic programs and games cartridges can be copied into the Eprom cartridge and played back at any time.
- **A 40 column ROM:** This will be available towards mid-February. It will enhance the VIC display to **25 lines per 40 columns** and offer the facility of adding a **second processor** (Intel 8088).

● TECHNICAL SPECIFICATIONS

MOTHERBOARD: 3 × 22 way gold plated connectors. Accepts all **Commodore cartridges**. Accepts **Toshiba 2016** or **Hitachi 6116 CMOS Ram** (qty: 4). **Write protect** switch fitted. **Mode** switch and **battery connector** fitted only when supplied with 8K **Hitachi Ram**.

● **SPECIAL RAM CARTRIDGE:** uses single 5V supply Dynamic Ram. **Transparent refresh** without slowing processor speed. **Access time:** 250ns maximum. **Capacity:** 16K or 32K bytes, addressed from \$ 2000 — 7FFF and \$A000 — BFFF. Switch fitted to partially disable any 8K memory block.

● **SPECIAL EPROM CARTRIDGE:** **Memory capacity:** up to 32K Eproms (4 × 2764s). Programs Eproms from **Basic** or **Machine code** programs or directly copies ready made cartridges. All saved programs have separate entry to the **Eprom catalog** (held in the first Eprom) and can be loaded back and run at any time. Addressed from \$ 9800 — 9FFF and is compatible with all **Commodore cartridges**.

● **40 COLUMN ROM (ADVANCE INFORMATION ONLY):** 8K bytes. Can communicate with 2nd processor via 2K dual port Ram and interrupt.

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16K SPECIAL RAM CARTRIDGE	1	£34.95	£34.95
8K SPECIAL EPROM CARTRIDGE	1	£29.95	£29.95
8K EXTRA RAM (HITACHI) FOR MOTHERBOARD (OPTIONAL)	1	£19.50	£19.50
16K EXTRA RAM (OPTIONAL) (OPTIONAL to make FOR RAM CARTRIDGE make 32K CARTRIDGE)	1	£11.95	£11.95
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GIVE YOUR VIC



Hold the LIGHT PEN like a normal pen, point it at your TV screen and the pen tells your VIC-20 what it sees!

Instead of pressing keys, touch the screen with your LIGHT PEN and move your man in CHESS, create LIFE, play OTHELLO, take in DRAUGHTS, play GO.

Point the pen at your man and move him to his new position.

Many games are already available for the LIGHT PEN and many more are being developed. You can write programs which allow you to read with your LIGHT PEN from the TV screen or place images or words on the screen. e.g. From a long list on your screen use the LIGHT PEN to choose the facts and figures you want.



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